ANSWERS & EXPLANATIONS
GENERAL STUDIES (P) TEST – 3802 (2023)

Q 1.A

- **Leatherback Turtle is the largest of the living sea turtles, weighing as much as 250-700 kg.**
- Distribution: Found in tropical and temperate waters of the Atlantic, Pacific, and the Indian Oceans.
- **Jellyfish is their primary food.**
- **Habitat:** Tropical and subtropical oceans.
- **Threats:** High sea fishing operations, harvesting of eggs, destruction of nests by wild predators and domesticated species such as cats, dogs and pigs, artificial lighting disorients hatchlings and adults and causes them to migrate inland rather than towards the sea.
- **Conservation Status:**
  - IUCN Red List Status: Vulnerable
  - Wildlife Protection Act: Schedule I
  - CITES: Appendix I
- **Hence option (a) is the correct answer.**

Q 2.D

- Ecological Fiscal Transfers (EFT) transfer public revenue between governments within a country based on ecological indicators. It is a type of conditional environmental payments which involves payments from higher levels of a country's government (e.g. national) to lower levels (e.g. state or local).
- **EFTs distribute a share of intergovernmental fiscal transfers and revenue sharing schemes according to ecological indicators such as protected areas or watershed management areas etc.** These conservation areas thus become a source of income for the receiving governments.Today, EFT are often seen as an instrument that incentivizes decentralized conservation efforts.
- **Hence option (d) is the correct answer.**
- States are motivated to protect & restore forests as an investment in future revenue from EFTs.
- India's 14th Finance commision announced ecological fiscal transfers in February, 2015.

Q 3.A

- **Union Agriculture Minister chaired the first steering committee meeting of the National Natural Farming Mission**
- Natural Farming is a chemical-free alias traditional farming method. **It is considered as agroecology-based diversified farming system which integrates crops, trees and livestock with functional biodiversity. Hence statement 1 is correct.**
- In India, Natural farming is promoted as **Bharatiya Prakritik Krishi Paddhati Programme (BPKP)** under a centrally sponsored scheme- Paramparagat Krishi Vikas Yojana (PKVY). **Hence statement 2 is correct.**
  - BPKP is aimed at promoting traditional indigenous practices which reduces externally purchased inputs. It is largely based on on-farm biomass recycling with major stress on biomass mulching, use of on-farm cow dung-urine formulations; periodic soil aeration and exclusion of all synthetic chemical inputs. According to HLPE Report, natural farming will reduce dependency on purchased inputs and will help to ease smallholder farmers from credits burden.
  - The BPKP programme has been adopted in State of Andhra Pradesh, Karnataka, Himachal Pradesh, Gujarat, Uttar Pradesh and Kerala.

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- There are several states practicing Natural Farming. Prominent among them are Andhra Pradesh, Himachal Pradesh, Gujarat, Kerala, Jharkhand, Odisha, Madhya Pradesh, Rajasthan, Uttar Pradesh and Tamil Nadu.
- **Gujarat has the largest area under Natural Farming (31.1%), followed by Andhra Pradesh (28.8%) and Madhya Pradesh (11%). Hence statement 3 is not correct.**
- National Mission on Natural Farming aims at creating institutional capacities for documentation and dissemination of best practices and make practicing farmers as partners in promotion strategy.

Q 4.D

- **"Ecological succession" is the observed process of change in the species structure of an ecological community over time.** Succession occurs due to large scale changes or destruction (natural or manmade). Within any community some species may become less abundant over some time interval, or they may even vanish from the ecosystem altogether. Similarly, over some time interval, other species within the community may become more abundant, or new species may even invade into the community from adjacent ecosystems. This observed change over time in what is living in a particular ecosystem is "ecological succession".
- **Primary succession** is an ecological succession where a newly formed area is colonized for the first time by a group of species or a community. This previously uninhabited, barren area is usually lacking topsoil and organic matter. **Hence statement 1 is correct.**
    - **The species colonizing an uninhabited area for the first time is referred to as the pioneer species and the dominating community is called pioneer community. For example, in primary succession on a terrestrial site, the new site is first colonised by a few hardy pioneer species that are often microbes, lichens and mosses.**
- **Secondary succession occurs when a previously occupied area is colonized by a new dominating group of species or communities.**
    - In secondary succession, the new inhabitants replace the previous communities over a habitat that had been exposed to a particular ecological disturbance. The disturbance may be an external or an internal factor. An example of secondary succession is the recolonization of an area damaged by fire. **Hence statement 2 is not correct.**
    - Primary succession takes a longer period of time to be established and completed, i.e. a thousand or more years. On the contrary, the secondary succession often occurs relatively faster, requiring only a shorter period of time, like a decade or a hundred years. This is because an area that has just been newly formed would be initially unfavorable for most life forms.
- There is a concept in ecological succession called the **"climax" community.** It is the final stage of succession. The climax community represents a stable end product of the successional sequence. **Though forests form the climax community in most of the ecosystems, in the grassland ecosystem grasses form the climax community.**
    - The stage leading to the climax community is called successional stages or seres. **Each transitional community that is formed and replaced during succession is called a stage in succession or a seral community. Hence statement 3 is correct.**

Q 5.D

- In 1988, British ecologist Norman Myers published a seminal paper identifying 10 tropical forest “hotspots.” He introduced the concept of biodiversity hotspots These regions were characterized both by exceptional levels of plant endemism and serious levels of habitat loss.
- Subsequently, Conservation International in association with Mayers introduced two strict quantitative criteria, for a region to qualify as Biodiversity Hotspot
- It must have **at least 1,500 vascular plants as endemics — which is to say, it must have a high percentage of plant life found nowhere else on the planet.** A hotspot, in other words, is irreplaceable. **Hence, statement 1 is not correct.**
- It must have 30% or less of its original natural vegetation. In other words, it must be threatened.
- There are 36 Biodiversity Hotspots in the world which represent just 2.5% of Earth’s land but support over 50% of the world’s endemic species.
- India is home to 4 biodiversity hotspots out of 36, namely:

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- **The Himalayas**: Includes the entire Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China and Myanmar)
- **Indo-Burma: Includes entire North-eastern India, except Assam and Andaman group of islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia, and southern China)**
- Western Ghats & Sri Lanka: Includes entire Western Ghats (and Sri Lanka)
- Sundaland

- Sundaland consists of the Western half of the Indonesian archipelago. **The part of India that falls in the Sundaland Hotspot is the Nicobar Islands. It does not contain the whole of the Andaman and Nicobar Island group. Hence, statement 2 is not correct.**

Q 6.B

- EMIT mission helped to identify more than 50 super-emitters of methane gas in central Asia, west Asia and the southwestern United States of America.
  - Super-emitters are facilities, equipment, and other infrastructure, typically in the fossil-fuel, waste, or agriculture sectors, that emit methane at high rates.
- EMIT is a new class of spaceborne imaging spectrometers to study Earth. **It was installed on International Space Station to map prevalence of key minerals in dust-producing deserts and will advance understanding of airborne dust's effects on climate**. **Hence option (b) is the correct answer.**
- When strong winds on one continent stir up mineral rock dust (such as calcite or chlorite), the airborne particles can travel thousands of miles to affect entirely different continents. Dust suspended in the air can heat or cool the atmosphere and Earth's surface. This heating or cooling effect is the focus of NASA's Earth Surface Mineral Dust Source Investigation (EMIT) mission.
- Mineral dust has many other effects on our planet. It can help form clouds or change atmospheric chemistry. When the dust settles in water or on land it can provide nutrients for ecosystem growth. If it falls on snow or ice, mineral dust can increase sunlight absorption and accelerate melting. Mineral dust in the air can reduce visibility or harm human health.

Q 7.B

- The UNESCO MAB (Man and Biosphere) program is an intergovernmental scientific program that aims to establish a scientific basis for enhancing the relationship between people and their environments. It combines the natural and social sciences with a view to improving human livelihoods and safeguarding natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate and environmentally sustainable.
- The World Network of Biosphere Reserves (protected under UNESCO MAB) currently counts 738 sites in 134 countries all over the world, including 22 transboundary sites.
- In India, there are 18 biosphere reserves out of which 12 have been protected under the UNESCO MAB.
- The 12 biosphere reserves which are protected under UNESCO MAB are:
  - Nilgiri Biosphere Reserve (Tamil Nadu)
  - Gulf of Mannar Biosphere Reserve (Tamil Nadu)
  - Sundarbans Biosphere Reserve (West Bengal)
  - Nanda Devi Biosphere Reserve (Uttarakhand)
  - Pachmarhi Biosphere Reserve (Madhya Pradesh)
  - Nokrek Biosphere Reserve (Meghalaya)
  - Simlipal Biosphere Reserve (Odisha)
  - Achanakmar-Amarkantak Biosphere Reserve (Chhattisgarh)
  - Great Nicobar Biosphere Reserve (Great Nicobar)
  - **Agasthyamala Biosphere Reserve (Kerala and Tamil Nadu)**
  - Kanchenjunga Biosphere Reserve (Part of North and West Sikkim districts)
  - **Panna Biosphere Reserve (Madhya Pradesh)**
- **Hence option (b) is the correct answer.**

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Q 8.D

- **Agricultural and Processed Food Products Export Development Authority (APEDA) intends to achieve this by exporting value-added and processed organic millet products to at least 100 countries. APEDA aims to raise millets export to ₹2,000 cr by FY26.**
- They are small-seeded grasses belonging to the botanical family Poaceae.
- Benefits of Millets:
  - **Millets are highly adaptive to a wide range of ecological conditions and thrive well in rain-fed; arid climates and they have minimal requirements of water, fertilizers, and pesticides. Hence statement 2 is correct.**
  - Health-promoting nutritious crop: Compared to other cereals they have a superior micronutrient profile and bioactive flavonoids.
  - **Millets have a low Glycemic Index (GI) and are also associated with the prevention of diabetes. Hence statement 3 is correct.**
  - They are good sources of minerals like iron, zinc, and calcium.
  - **Millets are gluten-free and can be consumed by celiac disease patients. Hence statement 1 is correct.**
  - Millet has a beneficial effect on the management and prevention of hyperlipidemia and risk of cardio-cascular disease (CVD).
  - Millets are found to be helpful with the reduction of weight, BMI, and high blood pressure.
  - In India, Millet is generally consumed with legumes, which creates mutual supplementation of protein, increases the amino acid content, and enhances the overall digestibility of protein.
  - Millets are used for dual purposes as food as well as fodder, which make it more farming efficient.
  - Millet cultivation helps to reduce the carbon footprint.
- India is among the top 5 exporters of millet in the world. World export of millet has increased from $400 million in 2020 to $470 million in 2021 (ITC trade map) India exported millets worth $64.28 million in the year 2021-22, against $59.75 million in 2020-21.
- **The main millet-growing states in India are Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, and Madhya Pradesh.**

Q 9.D

- Wetlands are unique, productive ecosystems where terrestrial and aquatic habitats meet. Wetlands play a critical role in maintaining many natural cycles and supporting a wide range of biodiversity.
- Wetlands are particularly important providers of all water-related ecosystem services. **They regulate water quantity, groundwater recharge, and can contribute to regulating floods and the impacts of storms.** Wetlands also help in erosion control and sediment transport, thereby contributing to land formation and increasing resilience to storms.
- **Wetlands purify and filter harmful waste from water.** Plants from wetlands help absorb harmful fertilizers and pesticides, as well as heavy metals and toxins from industry. **They help in nutrients recycling, groundwater recharge and stabilisation of local climates.** Wetlands act as nature's sponges. Peatlands, wet grasslands and floodplains in river basins act as natural sponges by absorbing rainfall and creating wide surface pools that ease flooding in rivers. The same storage capacity can also safeguard against drought.
- **Wetlands help fight climate change.** Peatlands alone store more than twice as much carbon as all the world's forests. Faced with rising sea levels, coastal wetlands reduce the impact of typhoons and tsunamis. They also bind the shoreline and resist erosion.
- **Hence option (d) is the correct answer.**

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Q 10.D

- Organisms have the ability to adapt to new environments. However, every individual or species has a specific range to which it can tolerate ecological changes. This is known as **ecological amplitude**. Based on the ecological amplitude:
    - **Ecotype is a phenotype of an organism when it lives in a new environment for too long a time period.** In other words, when an ecophene remains in its new habitat for too long, it becomes an ecotype. Therefore, the adaptations are permanent, and genetic changes occur within the organism. The genes they carry are responsible for the success in the new environment. Adaptations of the ecotypes are based on the interactions between their genes with their new environment. Therefore, they become best adapted to the new habitat and the prevailing conditions.
    - **Ecophene is the first response or phenotype an organism shows when it arrives in a new environment.** It is a morphologically changed phenotype. But the adaptation and changes are not permanent, and they are reversible. These adaptations are temporary changes. They develop only to survive under new environmental conditions. Genetic changes do not happen. Therefore, when the organism returns to the normal habitat, changes are reversed to the normal morphology. **Hence option (d) is the correct answer.**

Q 11.D

- **Recent Context**: Rare flight of Antarctic's Light-mantled Albatross to T.N. coast intrigues researchers.
- Asia's first sighting of the Light-mantled Albatross, **a seabird native to the Antarctic seas, was recorded near Rameswaram coast (Tamil Nadu). Hence statement 2 is correct.**
- **This seabird habits over a circumpolar distribution in the Southern Ocean and forages over the cold Antarctic waters as far south as the pack ice in summer. Hence statement 1 is correct.**
- It breeds on several sub-Antarctic islands, such as Macquarie Islands, Heard Island and McDonald Islands (Australia), South Georgia Island (British Overseas Territory), Prince Edward Islands (South Africa), Iles Kerguelen and Iles Crozet (France), and Auckland, Campbell, and Antipodes Islands (New Zealand).
- IUCN status: Near Threatened**. Hence statement 3 is correct.**

Q 12.D

- Pyramid of numbers represents the total number of individuals of **different species (population) at each trophic level.**
- In a forest ecosystem, large sized trees are the producers, which are less in number and so form a narrow base. The trees support large number of herbivores like insects, birds, frogs, etc. including several species of animals that feed upon leaves, fruits, flowers, bark, etc. of the trees. They are large in number than trees and hence form a middle broad level. The secondary consumers like predatory birds (hawks, eagle, etc.), foxes, snakes, lizards, etc. are less in number than herbivores while top carnivores like lion, tiger, etc. are still smaller in number making the pyramid gradually narrow towards apex. **So the pyramid assumes a spindle shape with narrow on both sides and broader in the middle.**
- **In grassland and aquatic ecosystems, pyramid of number is upright.** The producers in the grassland are the grasses and in aquatic ecosystems are phytoplanktons (algae etc.) which are small in size and large in number per unit area. So the producers form a broad base in the pyramid. The herbivores in the grassland are the insects; carnivores are frogs, birds, etc. and top carnivores are hawk, eagle, foxes etc. which are gradually less and less in number and so the pyramid apex becomes gradually narrower forming an upright and erect pyramid. **Hence option (d) is the correct answer.**
    - Similar is the case with herbivores (zooplanktons, etc.), carnivores (small fishes, etc.) and top carnivores (large fishes, crocodile, etc.) in aquatic ecosystems (pond, lake or marine ecosystem) which decreases in number at higher trophic levels, thus forming an upright pyramid of numbers.

Q 13.B

- Recently, Arunachal Pradesh celebrated five-day Bugun Liocichla Utsav at Eaglenest wildlife sanctuary in Arunachal Pradesh. The festival commemorates 15 years of the declaration of the bird as a new species. The festival was organised by Singchung Bugun Village Community Reserve (SBVCR) and the Shergaon Forest Division.

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- **Statement 1 is not correct:** Bugun Liocichla is not a migratory bird. It is an indigenous bird that is seen in select pockets of Eaglenest Wildlife Sanctuary in Arunachal Pradesh.
- **Statement 2 is correct:** It was the first bird discovered since India's Independence. The bird was first discovered by astrophysicist Ramana Athreya in 1995 and again in 2006 at the Singchung Bugun Village Community Reserve, a biodiversity hotspot spread in 234 sq km. There are only 14-20 such birds in the state. They occupy 3-4 square kilometre area in the temperate forest, within the traditional lands of Singchung village. The International Union for the Conservation of Nature has classified this species as critically endangered.
- **Statement 3 is correct:** The bird has been named in honour of the efforts of the Bugun community of Singchung village in West Kameng district in conserving the wildlife and forest of the area. The Buguns are an indigenous community with a population of about 2,000 people, spread across 12 villages that are dotted outside the forests of Eaglenest Wildlife Sanctuary. Sinchung in particular, is significant because it was here that the bird was discovered in the village's community-owned forest.

Q 14.B

- **India's first privately developed launch vehicle, Vikram-S, blasted off on its maiden flight from the Indian Space Research Organisation's Sriharikota spaceport.**
- The mission, named Prarambh, or 'the beginning', marks the Indian private sector's first foray into the promising space launch market. **The rocket has been developed by Hyderabad-based Skyroot Aerospace, a company that was started in 2018.** It is called Vikram-S. It is named after Vikram Sarabhai, the founder of India's space programme. **Hence statement 1 is not correct.**
- It is world's first few **all-composite rockets that has 3-D printed solid thrusters for spin stability of the launch vehicle.**
- The engine used in the launch vehicle is named after former president Dr A.P.J. Abdul Kalam.
  - The performance of the 'Kalam-80' will be one of the key areas that the company will monitor during the flight of Vikram-S.
- Mission Prarambh saw Vikram-S carry three customer satellites in a sub-orbital flight. In a sub-orbital flight, the vehicle travels slower than the orbital velocity — which means it is fast enough to reach outer space, but not fast enough to stay in an orbit around the Earth.
  - Tycoons Jeff Bezos and Richard Branson have undertaken sub-orbital flights to the edge of space.
- Vikram-S will carry three satellites, including one by SpaceKidz India called FunSat, parts of which were developed by school students.
- The Vikram rockets will be able to carry between **290 kg and 560 kg payloads into sun-synchronous polar orbits**. In comparison, India's workhorse PSLV can carry up to 1,750 kg to such an orbit. The newly-developed **Small Satellite Launch Vehicle (SSLV),** meant for carrying smaller commercial satellites, **can carry up to 300 kg to sun-synchronous orbit. Hence statement 2 is correct.**

Q 15.C

- Vultures are an important species that have environmental, health and cultural value for Indians. A total of nine species of vultures are found in India, both resident and migratory.
- Nine species of vultures are recorded in India. Out of these, five belong to the genus Gyps:
  - the oriental white-backed Vulture (OWBV) Gypsbengalensis,
  - the Long-billed Vulture (LBV) G.indicus,
  - the Slender-billed Vulture (SBV) G. tenuirostris(all residents),
  - the Himalayan Vulture (HV) Gypshimalayensis (largely wintering) and
  - the Eurasian Griffon (EG) Gyps fulvus (strictly wintering).
- Restfour are monotypic.
  - These include the Red-headedVulture (RHV) Sarcogyps calvus,
  - Egyptian Vulture(EV) Neophron percnopterus,
  - Bearded Vulture(BV) Gypaetus barbatus (all residents) and
  - Cinereous Vulture (CV) Aegypius calvus (strictly wintering). A sub-species of EV Neophronpercnopterus percnopterus is largely wintering.

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- **Resident vulture species**
  - **White-rumped vulture,**
  - **Indian vulture,**
  - **Slender-billed vulture,**
  - **Red-headed vulture,**
  - **Bearded vulture and**
  - **Egyptian vulture**
- **Migratory or visitor Vulture Species**
  - **Cinereous vulture,**
  - **Eurasian Griffon vulture or Eurasian vulture.**
  - **Himalayan vulture.**
- **Out of the nine vulture species found in India, four are designated as 'Critically Endangered', three are designated 'Near Threatened' and one is 'Least concerned' by IUCN.**
- About Eurasian Griffon Vulture (EG) or Eurasian Vulture, the details can be found below. **Hence option (c) is the correct answer.**

Table 1. Status of Vultures in India *(Prakash et al 2017)*

Species	Resident/ Migratory	Conservation (Global)	Status Conservation (Wildlife Protection Act 1972)	Estimated Population in India
Bearded (BV)	Resident	Near Threatened	Schedule-I	Not available
Cinereous (CV)	Winter visitor	Near Threatened	Schedule-IV	Not available
Egyptian (EV)	Resident	Endangered	Schedule-IV	Not available
Eurasian (EG)	Winter visitor	Least Concern	Schedule-IV	Not available
Himalayan (HV)	Winter/resident	Near Threatened	Schedule-IV	Not available
Long-billed (LBV)	Resident	Critically endangered	Schedule-I	26,500
Red-headed (RHV)	Resident	Critically endangered	Schedule-IV	Not available
Slender-billed (SBV)	Resident	Critically endangered	Schedule-I	1,000
Oriental White-backed (OWBV)	Resident	Critically endangered	Schedule-I	6,000

Q 16.B

- **Gharial**:
  - Gharial are fish-eating freshwater crocodile.
  - It is amongst the longest of all living crocodilians.
  - Habitat: clean rivers with sand banks. Gharials once thrived in all the major river systems of the Indian subcontinent. Today, they are extinct in the Indus, the Brahmaputra of Bhutan and Bangladesh, and in the Irrawaddy River.
  - Distribution:
    - Only viable population in the National Chambal Sanctuary spread across 3 states of Uttar Pradesh, Rajasthan and Madhya Pradesh.
    - Small non-breeding populations exist in Son, Gandak, Hoogly, Ghagra rivers & Satkosia Sanctuary (Odisha).
  - **Conservation Status:**
    - **IUCN Red List Status: Critically Endangered**
    - Wild Life Protection Act (WPA): Schedule I
    - CITES: Appendix I
- **Mugger/Indian Crocodile/Broad Snouted Crocodile:**
  - The mugger (marsh/India) crocodile (Vulnerable) is a freshwater species found sparsely in various lakes, rivers and marshes in the Indian subcontinent. Significant populations occur in middle Ganga (Bihar and Jharkand), Chambal River (Rajastan and Madhya Pradesh) and in Gujarat. **Hence option (b) is the correct answer.**

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- Habitat: Inhabits freshwater lakes, rivers and marshes, and prefers slow-moving, shallow water bodies. It is also thriving in artificial reservoirs & irrigation canals.
- Distribution: Found throughout India. Extinct in Bhutan
- **Conservation Status:**
  - **IUCN Red List Status: Vulnerable**.
  - WPA: Schedule I
  - CITES: Appendix I

- **Saltwater Crocodile**:
  - **Saltwater Crocodile is the largest living reptile and crocodilian known to science.**
  - Apart from the eastern coast of India, the saltwater
  - crocodile is extremely rare on the indi- an subcontinent.
  - Habitat: Saltwater habitats and brackish wetlands.
  - Distribution: India's east coast (Odisha's Bhitarkanika Wildlife Sanctuary, Andaman and Nicobar Islands coasts & Sundarbans), across Southeast Asia and the Sundaic region to northern Australia.
  - **Conservation status:**
    - IUCN Red List Status: Least Concern
    - WPA: Schedule I
    - CITES: Appendix I
- **All the three crocodile species are included in WPA: Schedule I and CITES: Appendix I**

Q 17.C

- The magnitude of the damage caused by the locusts in India in current times during the time of Corona has been alarming. **Locusts belong to the family Acrididae**. Being polyphagous feeders, an average small locust swarm can eat as much food in a day as about 10 elephants, 25 camels or 2500 people as per the FAO.
- Locusts cause damage by devouring the leaves, flowers, fruits, seeds, bark and crops. They have the capacity to break down trees because of their weight settled in mass. **Locusts reported in India are desert locust (Schistocerca gregaria), migratory locust (Locusta migratoria), Bombay locust (Nomadacris succincta) and tree locust (Anacridium sp.).Hence option (c) is correct answer.**
- The locust has three distinct stages - egg, hopper and adult. Swarms of gregarious adults migrate downwind and can cover up to about 150 km/day. Guaiacol, produces in the gut of desert locusts by the breakdown of plant material and undertaken by the gut bacterium Pantoea agglomerans, is the important constituent of pheromones that cause locust swarming.
- **Climate change is the key factor of the current outbreak.** During dry spells, solitary locusts are forced together in the patchy areas of land with remaining vegetation. This sudden crowding releases serotonin in their central nervous systems that make locusts more sociable and promote rapid movements and more varied appetite.
- **Unusual weather conditions generate strong cyclones and heavy rains in the Arabian Peninsula, triggering higher than normal vegetation growth that create a conducive environment for locusts to feed on and surge.** Increasing sea temperatures lead to more extreme rainfall - creating suitable conditions for hatching and breeding.

Q 18.B

- **Cold Desert Biosphere Reserve, designated so in 2009**, is an important Cultural Landscape of India is situated in the Himalayas and stretches from Ladakh in the north to Kinnaur (in the state of Himachal Pradesh) in the south.
- The region constitutes a Cold Desert biome with harsh climatic conditions, which can be attributed to two factors. One is its location on the **leeward side of the Himalayas**, which makes it a rain-shadow zone inaccessible to the annual southeastern monsoon winds that sweep the rest of the country, thus creating desert conditions with low levels of precipitation. Second is its very high elevation (ranging from 3000 – 5000m ASL) which adds to the coldness of its environment.

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- A huge seasonal variation is seen in the climatic conditions, ranging from short and dry summers with harsh sunlight (maximum temperature reaching up to 36˚C during the day) to long, windy, and freezing winters (minimum temperature touching -32˚C at night).
- Cold Desert is noted for the preservation of the snow leopard. It is stretched along the Western Himalayas, from Ladakh to Kinnaur, in Himachal Pradesh.
- It comprises the **Pin Valley National Park and its surroundings, Kibber Wildlife Sanctuary, Sarchu, and Chandratal**, etc. Some of the common fauna you can spot here include Himalayan black bears, Himalayan blue sheep, Himalayan ibex, snow pigeons, Tibetan gazelle, woolly hare, red fox, etc. **Hence, option (b) is the correct answer.**

Q 19.D

- Bioprospecting refers to biodiversity prospecting. It is the process of discovery and commercialization of new products based on biological resources. **Hence statement 1 is correct.**
- These biological resources may include **chemical compounds, genes, micro-organisms, macro-organisms, and other valuable products from nature. Hence statement 2 is correct.**
- **Pros of Bioprospecting**:
  - Bioprospecting, if well managed, can generate income for developing countries and their indigenous community.
  - It can provide incentives for the conservation of biological resources and biodiversity.
  - It can lead to the discovery of new drugs. **Hence statement 3 is correct.**
- **Cons of Bioprospecting:**
  - If not well managed, bioprospecting may lead to environmental problems related to unauthorized (over-) exploitation.
  - Social and economic problems related to the unfair sharing of benefits -or the total absence of benefit sharing- and to disrespect for the rights, knowledge and dignity of local communities.
- Thus bioprospecting in itself is not bad. However, it is its misuse (leading to biopiracy) that creates problems for nature and humankind.

Q 20.B

- About two-thirds of our Earth's surface is covered by water, and the oceans hold about 96.5 per cent of the entire Earth's water. Thus, the oceans are the most significant source of our present and future energy requirements. Water exists everywhere, in the ocean, river, pond, lake, glacier, air or soil moisture.
- Different organisms are found in different ocean depths, providing a colourful spectrum to marine life and its ecosystem. According to scientific studies, so far, about 2.5 lakh marine life species have been identified all over the world. Scientists estimate that two million more species exist in the ocean, yet to be discovered.
- **Bathypelagic Zone:**
  - Below the midwater zone comes the bottom depth of the sea, i.e., the depth from 1000 to 4000 metres. The zone beyond the 6000 metre depth i.e. **Hadalpelagic Zone (teaches) is the bottom most layer of the ocean. Hence statement 2 is not correct.**
  - It is called the midnight or Bathypelagic Zone.
  - **The organisms found here are illuminated by bioluminescence. Hence statement 1 is correct.**
  - The water pressure in this zone is very high. But surprisingly, despite such adversities, innumerable creatures are found here.
  - **The sea creatures here are primarily black or red in the absence of light.** The average temperature here remains below 4 degree Celsius. **Hence statement 3 is correct.**

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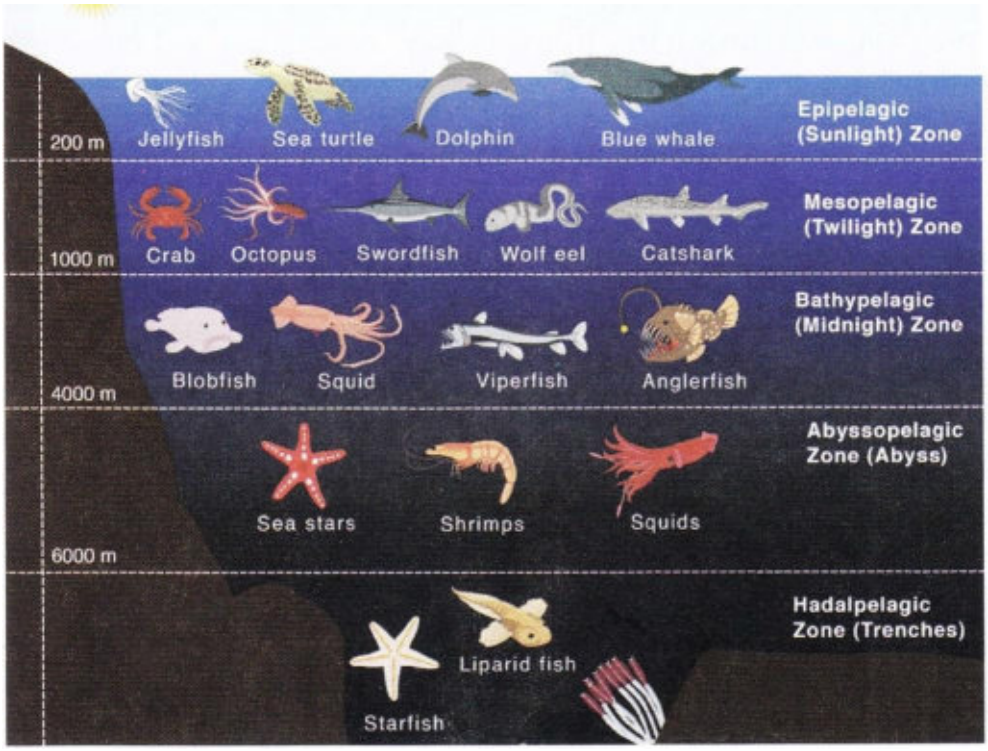

Q 21.C

- The Cartagena Protocol on Biosafety to the Convention on Biological Diversity is an international treaty **governing the movements of living modified organisms (LMOs) resulting from modern biotechnology from one country to another.**
  - It was adopted on 29 January 2000 as a supplementary agreement to the Convention on Biological Diversity and entered into force on 11 September 2003.
- The Protocol seeks to protect biological diversity from the potential risks posed by living modified organisms resulting from modern biotechnology.
  - LMOs that are pharmaceuticals for humans are excluded from the scope of the protocol if they are covered by other international agreements or arrangements.
- Parties to the protocol must ensure that LMOs are handled, packaged, and transported under conditions of safety. Furthermore, the shipment of LMOs subject to transboundary movement must be accompanied by appropriate documentation specifying, among other things, the identity of LMOs and contact point for further information.
  - These procedures and requirements are designed to provide importing Parties with the necessary information needed for making informed decisions about whether or not to accept LMO imports and for handling them in a safe manner.
  - **Thus it regulates the transboundary movement of LMOs. Hence statement 1 is correct.**
- It establishes an advance informed agreement (AIA) procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their territory.
- **The Protocol also establishes a Biosafety Clearing-House to facilitate the exchange of information on living modified organisms and assist countries in implementing the Protocol. Hence statement 2 is correct.**
- The "Advance Informed Agreement" (AIA) procedure under the protocol applies to the first intentional transboundary movement of LMOs for intentional introduction into the environment of the Party of import.
  - It includes four components: notification by the Party of the export or the exporter, acknowledgment of receipt of notification by the Party of import, decision procedure, and review of decisions.
  - The purpose of this procedure is to ensure that importing countries have both the opportunity and the capacity to assess risks that may be associated with the LMO before agreeing to its import.

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Q 22.D

- A situation where indigenous knowledge of nature, originating with indigenous people, is used by others for profit, without permission from and with little or no compensation or recognition to the indigenous people themselves.
- Developed countries are exploiting developing countries genetic resources and indigenous communities traditional knowledge in the name of patents on the inventions derived from those genetic resources. This leads to **bio-piracy.**
- **Steps taken to prevent biopiracy:**
- India is a member of the **United Nations Convention on Biodiversity (CBD)** and as a mark of its ratification, India enacted the Biodiversity Act of 2002. **Hence statement 1 is correct.**
- Autonomous bodies such as **National Biodiversity Authority, State Biodiversity Boards, and Biodiversity Management Committees** have been constituted to regulate access to biological resources and associated traditional knowledge to ensure equitable sharing of benefits arising out of their use. **Hence statement 2 is correct.**
    - Biodiversity Protection Act, 2002 is an Act to provide for the **conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources**, knowledge, and for matters connected therewith or incidental thereto. India is rich in biological diversity and associated traditional and contemporary knowledge systems relating thereto.
    - The Act provides for the creation of the National Biodiversity Authority, State Biodiversity Board, and Biodiversity Management Committee.
    - Section 41 of the Act provides for the constitution of the **Biodiversity Management Committee.** It states that every local body shall constitute a Biodiversity Management Committee within its area for the purpose of promoting conservation, sustainable use, and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling of knowledge relating to biological diversity.
- **Traditional knowledge digital library**: It is a database that documents traditional knowledge and makes it available in the public domain. **Hence statement 3 is correct.**

Q 23.A

- **Hawksbill Turtle:**
    - Hawksbill Turtle species is migratory in nature & nesting occurs in about 70 countries across the world?
    - Maturation is slow and is estimated between 25 years.
    - Habitat: Nesting occurs on insular, sandy beaches.
    - Distribution: In India, they are found in the Andaman and Nicobar Islands, the coast of Tamil Nad & Orissa.
    - Threats: Turtle shell trade, egg collection, slaughter for meat, oil pollution and destruction of nesting and foraging habitats.
    - **Conservation Status:**
        - **IUCN Red List Status: Critically Endangered**
        - Wildlife Protection Act (WPA): Schedule I
        - CITES: Appendix I
- **Himalayan Griffon Vulture:**
    - It is one of the 22 species of large carrion-eating birds that live predominantly in the tropics and subtropics.
    - They act an important function as nature's garbage collectors and help to keep the environment clean of waste. Vultures also play a valuable role in keeping wildlife diseases in check.
    - They lives in the Himalayas on the Tibetan plateau (India, Nepal and Bhutan, central China and Mongolia).

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- It is also found in the Central Asian mountains (from Kazakhstan and Afghanistan in the west to western China and Mongolia in the east).
- Occasionally it migrates to northern India but migration usually only occurs altitudinally.
- Recently, Himalayan griffon vulture has been sighted for the first time at the Point Calimere WLS (TN).
- Conservation status:
  - **IUCN Red List Status: Near Threatened (NT)**
  - CITES: Appendix II

- **Saltwater Crocodile:**
  - Apart from the eastern coast of India, the saltwater crocodile is extremely rare on the Indian subcontinent.
  - Habitat: Saltwater habitats and brackish wetlands.
  - **Conservation status:**
    - **IUCN Red List Status: Least Concern**
    - WPA: Schedule I
    - CITES: Appendix I
- **Hence option (a) is the correct answer.**

Q 24.A

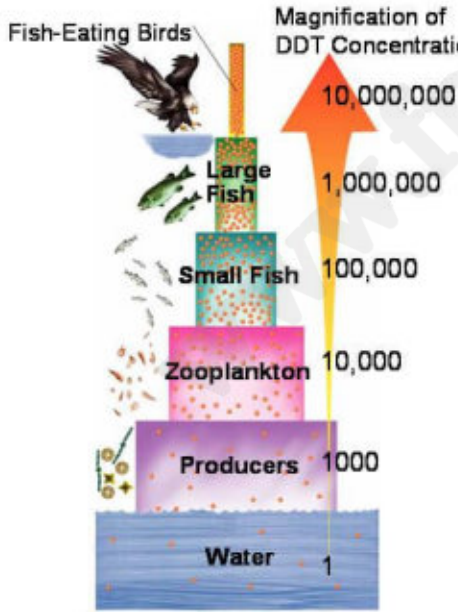
- **UNEP's International Methane Emissions Observatory launched the Methane Alert and Response System (MARS) at COP27. It is a new satellite-based system that will alert governments, companies, and operators about large methane sources to foster rapid mitigation action. Hence statement 1 is correct.**
- **Developed in the framework of the Global Methane Pledge Energy Pathway – with initial funding from the European Commission, the US Government, Global Methane Hub, and the Bezos Earth Fund –** MARS will allow UNEP to corroborate emissions reported by companies and characterize changes over time.
- **MARS will be implemented with partners including the International Energy Agency, and the UNEP-hosted Climate and Clean Air Coalition. Hence statement 2 is not correct.**
- **MARS will be the first publicly available global system** capable of transparently connecting methane detection to notification processes. It will use state-of-the-art satellite data to identify major emission events, notify relevant stakeholders, and support and track mitigation progress
- Methane released by human activities is responsible for around 25% of anthropogenic climate change.
- **Additional Information:**
  - **International Methane Emissions Observatory (IMEO)** is built upon the successful implementation of the Climate and Clean Air Coalition's (CCAC's) Mineral Methane Initiative.
    - It is a data-driven, action-focused initiative by the UN Environment Programme (UNEP) with support from the European Commission to catalyze a dramatic reduction of methane emissions, starting with the energy sector.
    - Since 2014, the CCAC Mineral Methane Initiative has focused on three projects to reduce methane emissions: the Oil and Gas Methane Partnership (OGMP), the Methane Science Studies (MSS), and the Global Methane Alliance (GMA).
    - The purpose of these initiatives is to achieve global methane emissions reductions from the oil and gas sector of 45% by 2025 and 60-75% by 2030.
  - The **World Meteorological Organization** (WMO) is an intergovernmental organization with a membership of 193 Member States and Territories.
    - It originated from the International Meteorological Organization (IMO), the roots of which were planted at the 1873 Vienna International Meteorological Congress.
    - Established by the ratification of the WMO Convention on 23 March 1950, WMO became the **specialised agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences a year later.**
    - The Secretariat, **headquartered in Geneva,** is headed by the Secretary-General.

Q 25.B

- **Territory:**
  - A territory is **a geographical area that an individual marks and defends.**
  - A territory provides a safe place for young to be raised and usually contains a breeding/nesting site at its center. Some organisms only have territories or defend themselves more vigorously during mating season. **A territory can be marked out using movements (displays), sound (calling), or smell (scent).** However, it costs time and energy to defend a territory. For this reason, territories are relatively small and some organisms will only defend their territory during mating season. **Hence, statement 2 is correct.**
  - Example: Wolves mark their territory by howling. All members in the pack will howl together as a warning to neighboring packs. This signals the range of their territory and how well defended it is.
- **Home range:**
  - This is the wider geographical area that an animal will seldom leave (unless they migrate in order to breed elsewhere). A**n animal's home range is usually much larger than its territory.** Unlike territories, a home range is not actively defended and home ranges may overlap. **Hence, statement 1 is not correct.**
  - The size of a home range will depend on:
    - The density of resources (food)
    - Population density
    - Competition with other species
    - Position in the hierarchy of the individual or group

Q 26.C

- Biomagnification refers to the condition where the chemical concentration in an organism exceeds the concentration of its food when the major exposure route occurs from the organism's diet.
- The term food web biomagnification is used to describe trophic enrichment of contaminants within food webs and refers to the progressive increase in chemical concentrations with increasing animal trophies status.
- In order for biomagnification to occur, the pollutant must be:
  - the pollutant must have a **long biological half-life (long-lived),**
  - must **not be soluble in water** but must be soluble in fats. E.g. DDT.
    - If the pollutant is soluble in water, it will be excreted by the organism.
    - Pollutants that dissolve in fats are retained for a long time. Hence it is traditional to measure the amount of pollutants in fatty tissues of organisms such as fish.
    - In mammals, milk produced by females is tested for pollutants since the milk has a lot of fat in.
  - **mobile**
  - **biologically active- Biologically-active compounds are those that affect biological processes in a way which has an impact on body function. Further, in order for biomagnification to occur, the pollutant must be biologically active**
  - **Hence option (c) is the correct answer.**



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Q 27.C

- Mass extinction refers to a substantial increase in the degree of extinction or when the Earth loses more than three-quarters of its species in a geologically short period of time.
- Many organizations including UNEP have concluded that the Earth is going through the sixth mass extinction and it is anthropogenic. But before this, all five mass extinction were caused due to natural phenomena. The causes and time period are given below.
    - **End-Ordovician (first mass extinction; 443 million years ago): It is the first mass extinction. A severe ice age led to the sea level falling by 100m, wiping out 60-70% of all species which were prominently ocean dwellers at the time. Then soon after the ice melted leaving the oceans starved of oxygen. Hence, statement 1 is not correct.**
    - Late Devonian, (second mass extinction; 360 million years ago): A messy prolonged climate change event, again hitting life in shallow seas very hard, killed 70% of species including almost all corals.
    - Permian-Triassic (third mass extinction; 250 million years ago): The big one – more than 95% of species perished, including trilobites and giant insects – strongly linked to massive volcanic eruptions in Siberia that caused a savage episode of global warming.
    - **Triassic-Jurassic (fourth mass extinction; 200 million years ago): Three-quarters of species were lost, again most likely due to another huge outburst of volcanism. It left the Earth clear for dinosaurs to flourish. Hence, statement 3 is correct.**
    - **Cretaceous-Tertiary (fifth mass extinction; 65 million years ago): A giant asteroid impact on Mexico, just after large volcanic eruptions in what is now India, saw the end of the dinosaurs and ammonites. Mammals, and eventually humans, took advantage. Hence, statement 2 is correct.**

Q 28.C

- **Wildfires are predicted to worsen in the coming years and decades, the United Nations Environment Programme (UNEP) has warned in its annual Frontiers report released in 2022.**
- One of the major results of the Stockholm conference was the creation of the United Nations Environment Programme (UNEP). The United Nations Conference on the Human Environment was held in Stockholm, Sweden, from June 5–16 in 1972. **Hence, statement 1 is correct.**
- **Headquartered in Nairobi, Kenya, UNEP** works through its divisions as well as regional, liaison and out-posted offices and a growing network of collaborating centres of excellence. **Hence, statement 2 is correct.**
- It has released its Annual Frontiers Report titles Noise, Blazes and Mismatches. The report titled 'Noise, Blazes and Mismatches' identifies and draw attention to emerging issues of environmental concern.

Q 29.A

- **Russia has emerged as the biggest exporter of pig iron to India for April-September period of FY23. China remains the world's largest pig iron producer during 2021. Hence statement 3 is correct.**
- Pig iron is the product of smelting iron ore (also ilmenite) with a high-carbon fuel and reductant such as coke, usually with limestone as a flux. Charcoal and anthracite are also used as fuel and reductant. **Hence statement 1 is correct.**
- Pig iron is produced by smelting iron ore in blast furnaces or by smelting ilmenite in electric furnaces.
- The term "pig iron" dates back to the time when hot metal was cast into ingots before being charged to the steel plant. The moulds were laid out in sand beds such that they could be fed from a common runner. The group of moulds resembled a litter of sucking pigs, the ingots being called "pigs" and the runner the "sow."
- Pig Iron has a very high carbon content (3.5-4.5%) along with silica, manganese, sulphur, phosphorus, titanium and other trace elements.
- **High carbon content makes it brittle and not useful directly except for limited applications. Hence statement 2 is not correct.**
- It is refined to produce steel, wrought iron, alloys etc.

Q 30.C

- **The topmost zone near the shore of a lake or pond is the littoral zone. This zone is the warmest since** it is shallow and can absorb more of the Sun's heat. It sustains a fairly diverse community which can include several species of algae (like diatoms), rooted and floating aquatic plants, grazing snails, clams, insects, crustaceans, fishes, and amphibians.

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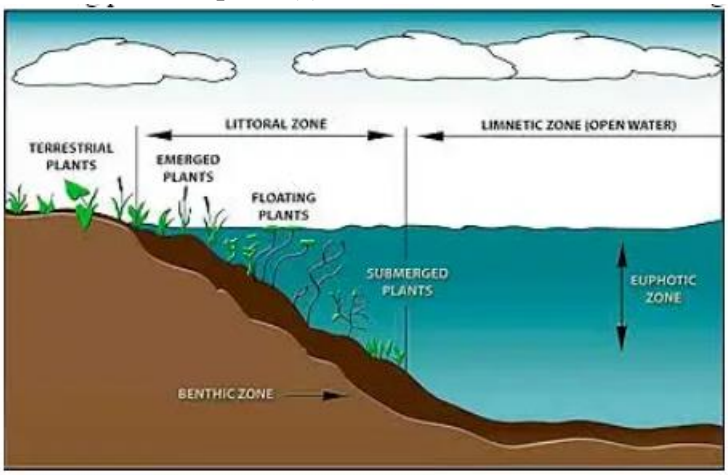
- The near-surface open water surrounded by the littoral zone is the limnetic zone. The limnetic zone is well-lighted (like the littoral zone) and is dominated by plankton both phytoplankton and zooplankton.
- The deep-water part of the lake or pond is called the profundal zone. This zone is much colder and dense than the other two. Little light penetrates all the way through the limnetic zone into the profundal zone.
    - Only respiration activity takes place in this zone.
    - Also known as aphotic zone.
    - The fauna are heterotrophs, meaning that they eat dead organisms and use oxygen for cellular respiration.
- **Nektons are animals which are swimmer.**
    - They are relatively large and powerful as they have to overcome the water currents.
- Floating plants are called as neuston. These are unattached organisms which live at the air water interface. **Hence option (c) is the correct answer.**



Q 31.B

- The 26th edition of the multinational maritime exercise MALABAR 22 culminated in the seas off Japan.
- The Malabar series of exercises began in 1992 as a bilateral exercise between the navies of **India and USA** and gained further prominence with joining of the navies of **Australia and Japan**.
- This edition also marked the 30th anniversary of the exercise and was hosted by the JMSDF (Japan Maritime Self-Defense Force). Apart from operational drills and exercises, the bilateral logistics support agreements between the participating countries were validated during this edition of exercise Malabar.
- Military Exercises between **India and USA: Yudh Abhyas and Vajra Prahar**
- Military Exercises between **India and Japan: Dharma Guardian**
- **Hence option (b) is the correct answer.**

Q 32.A

- For most of the year, the tundra biome is a cold, frozen landscape. It is a treeless polar desert. This biome has a short growing season, followed by harsh conditions that the plants and animals in the region need special adaptations to survive.
- Tundra form in two distinct cold and dry regions.
    - Arctic tundra are found on high-latitude landmasses, above the Arctic Circle.
    - **Alpine tundra are located at very high elevations atop mountains, where overnight temperatures fall below freezing. Alpine Tundra can be found at higher elevations in lower latitudes. Hence statement 3 is not correct.**
- Tundra regions typically get less than 25 centimeters (10 inches) of precipitation annually, which means these areas are also considered deserts. **Hence statement 2 is not correct.**
- The soil in the Arctic is largely permafrost or soil that remains frozen year-round, leaving only a thin surface layer of thawed soil in summer for plant roots to grow in. Tundra soil is also scarce in many of the nutrients that plants need to grow. Reptiles and amphibians are few or absent because of the extremely cold temperatures.

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- Most of the animals have long life. They are protected from chillness by the presence of thick cuticle and epidermal hair or fur. Mammals have a large body size and small tail and ears to avoid the loss of heat from the surface. **Hence statement 1 is correct.**

Q 33.B

- The Ramsar Convention on Wetlands is an intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
- The Convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. Since then, almost 90% of UN member states, from all the world's geographic regions, have acceded to become "Contracting Parties".
- Under the three pillars of the Convention, the Contracting Parties commit to
  - work towards the wise use of all their wetlands through national plans, policies and legislation, management actions and public education
  - designate suitable wetlands for the list of Wetlands of International Importance and ensure their effective management
  - cooperate internationally on transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.
- The Secretariat in Gland, Switzerland, manages the day-to-day activities of the Convention and publishes Convention documents and the "Ramsar List" of Wetlands of International Importance.
- It is administratively supported by the International Union for Conservation of Nature (IUCN).
- Each Contracting Party designates an Administrative Authority as its focal point for the implementation of the Convention.
- Countries are also encouraged to establish a broad-based National Wetland Committee.
- **Contracting Parties can place Ramsar Sites with a changing ecological character on the Montreux Record, and technical assistance such as a Ramsar Advisory Mission can be provided.**
  - The Montreux Record under the convention identifies Ramsar sites that are in need of priority conservation attention at national or international level, and is maintained as part of the Ramsar database.
  - Currently, Keoladeo National Park and Loktak Lake are placed under Montreux from India.
- The nine criteria for identifying Wetlands of International Importance under Ramsar convention are
  - A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
  - **A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.**
  - A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
  - A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
  - **A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.**
  - **A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.**
  - A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
  - A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.
  - A wetland should be considered internationally important if it regularly **supports 1% of the individuals i**n a population of one species or subspecies of **wetland-dependent nonavian animal species.**
- **Hence option (b) is the correct answer.**

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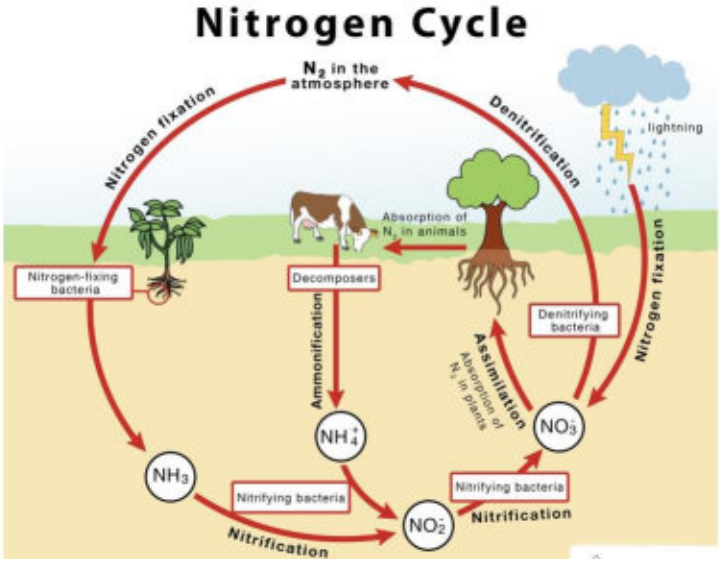
Q 34.C

- Nitrogen (N_2) in the atmosphere cannot be directly used as a nutrient by plants or animals. It must be converted into its compound form of ammonia (NH3), nitrates or nitrites. **Hence statement 1 is correct.**
- This occurs through four steps, of fixation, nitrification, ammonification and denitrification.
- Nitrogen fixing bacteria feed off the root nodules of certain plant species such as beans, peas and alfalfa while they fix nitrogen. This nitrogen is then converted into ammonia to be used by those plants.
    - Any unused ammonia undergoes nitrification. In the ammonification step, specialised bacteria and fungi feed and convert dead material (from animals) into compounds such as ammonia and water-soluble salts containing ammonium ions. These compounds are absorbed by plants for growth. In this manner, nutrients are recycled back from animals to plants.
- Finally, the denitrifcation step completes the nitrogen cycle as nitrogen leaves the soil and is released into the atmosphere as nitrogen or nitrous oxide gas. **Hence statement 2 is correct.**



Q 35.A

- ISRO's RISAT-2 satellite, launched in 2009, has made an uncontrolled re-entry into the Earth's atmosphere.
- Radar Imaging Satellite or RISAT is a series of Indian radar imaging reconnaissance satellites built by ISRO. **Hence statement 1 is correct.**
- **India had in April 2009 launched RISAT-2, the first of the series to reach orbit. It was bought from Israel** for USD 110 million largely for surveillance purposes. This Satellite enhanced ISRO's capability for Disaster Management applications. **Hence statement 2 is not correct.**
    - After the 26 November 2008, 2008 Mumbai attacks, the launch plan was modified to launch RISAT-2 before RISAT-1, since the indigenous C-band SAR to be used for RISAT-1 was not ready.
    - Though the initial designed life of the satellite was four years, due to proper maintenance of orbit and mission planning by the spacecraft operations team in ISRO and by economical usage of fuel, RISAT-2 provided very useful payload data for 13 years.
- In 2012, ISRO then launched what was India's first indigenous all-weather radar imaging satellite, known as RISAT-1. With a 160 x 4 Mbit/s data handling system and 50 Newton-meter-second reaction wheels, the satellite provides all-weather surveillance using synthetic aperture radars (SAR).

Q 36.C

- Peatlands are a type of wetlands that occur in almost every country on Earth, currently covering 3% of the global land surface. The term 'peatland' refers to the peat soil and the wetland habitat growing on its surface.
    - **In these areas, year-round waterlogged conditions slow the process of plant decomposition to such an extent that dead plants accumulate to form peat**. Peatland landscapes are varied – from blanket bog landscapes with open, treeless vegetation. **Hence statement 2 is not correct.**

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- Large amounts of carbon, fixed from the atmosphere into plant tissues through photosynthesis, are locked away in peat soils, representing a valuable global carbon store. At the same time, peatlands are the largest natural terrestrial carbon store. **Hence statement 1 is correct.**

- About 30% of the world's terrestrial soil carbon is found in peatland ecosystems. **Peatlands are most common across the boreal and subarctic zones of the Northern Hemisphere. Hence statement 3 is correct.**
- Peatlands are strongly influenced by hydrology, chemistry, and associated flora and vegetation, and occur as two types: fens and bogs.
  - A bog is a freshwater wetland of soft, spongy ground consisting mainly of partially decayed plant matter called peat. Bogs are generally found in cool, northern climates.
  - Bogs and poor fens are acidic and dominated by peat mosses, while rich fens are basic and dominated by true mosses, the remains of which are usually the most abundant component of the undecomposed peat.
  - Important processes that occur in peatlands are (1)acidification, (2) water retention, (3) oligotrophification (or nutrient sequestration), (4) methane production, and (5) sulfate reduction.

Q 37.C

- Snow leopards live in the mountainous regions of Central and Southern Asia. **In India, their geographical range encompasses a large part of the western Himalayas, including the Union Territories of Jammu and Kashmir and Ladakh, Himachal Pradesh, Uttarakhand and Sikkim and Arunachal Pradesh in the eastern Himalayas.**
  - In the IUCN-World Conservation Union's Red List of Threatened Species, the snow leopard is listed as Vulnerable.
  - In India, the snow leopard is listed under Schedule I of the Wildlife (Protection) Act, 1972, giving it the highest protection status under the country's laws.
- **Mount Harriet National Park, officially renamed as Mount Manipur National Park**, is a national park located in the Andaman and Nicobar Islands.
  - Mount Harriet is the third highest peak in the Andaman and Nicobar Islands.
  - **Mount Manipur National Park** is rich with various types of fauna and flora such as endemic Andaman Pig, bats, and Shrew, saltwater crocodiles, turtles. **Snow Leopards are not found in this national park since it lies in tropical zone.**
  - It supports all major forest types in the Andaman and Nicobar Islands namely Evergreen Forest, Andaman Moist Deciduous Forests, Andaman Semi-evergreen Forests, and Littoral Forests.
- **Saddle Peak National park is located in the Northern side of the Andaman Islands** and spreads in a scope of 33square miles. This national park was named after Saddle Peak, the saddle peak is at an altitude of 732metres making it the highest peak in the whole archipelago.
  - The main animal species in the park includes Andaman wild pig, water monitor lizard, and salt-water crocodiles. The important birds found here are Andaman hill mynah and imperial pigeon. **There are no snow leopards in this national park.**
- **Pin Valley National Park** is located in Himachal Pradesh which is situated in the cold desert area. The park covers an area of 675 sq km as core zone and 1150 km as buffer zone.
  - There are more than 20 species of animals and birds in the Park. **This park is specially renowned for the protection of endangered Snow-Leopard.** Other species are Ibex, Bharal, Red Fox, Marten, Weasel, Pika, Snow Cock, Beareded Vulture.
- Located in the eastern part of Ladakh district in Jammu and Kashmir in north India, **Hemis National Park** has the distinction of being the largest national park in South Asia.
  - This National Park is home to some of the most exotic and rare flora and fauna species. It was established in 1981 and it is named after the Hemis Monastery, founded in 1630 by Lama Tagstang. **The most sought after animal species of the park are Snow Leopards,** Shapu, Wild Sheeps, Ibex and Goats. Its natural habitat dwells over 17 mammal and 70 bird species.
- **Hence option (c) is the correct answer.**

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Q 38.A

- Save Silent Valley was a social movement aimed at the protection of Silent Valley, an evergreen sub-tropical forest in the Palakkad district of Kerala, India. **It was started in 1973 by an NGO led by Kerala Sasthra Sahithya Parishad (KSSP)** to save the Silent Valley from being flooded by a hydroelectric project. In February 1973, the Planning Commission approved the project at a cost of about Rs. 25 crores. The valley was declared Silent Valley National Park in 1985. After the announcement of imminent dam construction, the valley became the focal point of the **Save Silent Valley Movement,** India's fiercest environmental debate of the decade. Because of concern about the endangered lion-tailed macaque, the issue was brought to public attention. Also that year the IUCN (International Union of conservation of nature) passed a resolution recommending the protection of lion-tailed macaques in Silent Valley and Kalakkad and the controversy heated up. In 1979 the Government of Kerala passed legislation regarding the Silent Valley Protection Area (Protection of Ecological balance Act of 1979) and issued a notification declaring the exclusion of the hydroelectric project area from the proposed national park.
- **Narmada Bachao Andolan (NBA)** is an Indian social movement spearheaded by native tribals (adivasis), farmers, environmentalists, and human rights activists against a number of large dam projects across the Narmada River, which flows through the states of Gujarat, Madhya Pradesh, and Maharashtra. Sardar Sarovar Dam in Gujarat is one of the biggest dams on the river and was one of the first focal points of the movement. It is part of the Narmada Dam Project, whose main aim is to provide irrigation and electricity to people of the above states. In 1985, after hearing about the Sardar Sarovar dam, Medha Patkar and her colleagues visited the project site and noticed that project work was being checked due to an order by the Ministry of Environment and Forests, Government of India. The reasons for this were cited as "non-fulfillment of basic environmental conditions and the lack of completion of crucial studies and plans".The people who were going to be affected by the construction of the dam were given no information but the offer of rehabilitation. **In response to that, the movement started in the year 1985.**
- **Appiko Movement: In 1983,** men, women, and children of Salkani "hugged the trees" in Kalase forest. (The local term for "hugging" in Kannada is appiko.) Appiko Andolan gave birth to a new awareness all over southern India. The movement took place in the Uttar Kannada district of Karnataka.
- **Thus the correct order is 1-3-2. Hence option (a) is the correct answer.**

Q 39.D

- An ecosystem is a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment. **The part of the earth which is inhabited by the living organism is called as biosphere.**
- Ecosystems contain biotic or living, parts, as well as abiotic factors, or nonliving parts. Biotic factors include plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.
- **Habitat is the physical environment in which an organism lives (address of an organism). Many habitats make up the environment.**
- The habitat is a defined place or area of the environment according to the requirements of a particular life form. **Therefore, a habitat is always an environment, but an environment is not always a habitat. Hence statement 1 is correct.**
- A habitat always has life in it, whereas the environment does not necessarily have life in it.
- A habitat is always a preference of one species, whereas an environment could be a preference of many species that could eventually become many habitats.
- **Usually, the environment governs the properties of a habitat, *but not vice versa.*** A single habitat may be common for more than one organism which have similar requirements. For example, a single aquatic habitat may support a fish, frog, crab, phytoplankton and many others. The various species sharing a habitat thus have the same ‘address’. E.g. Forest, river etc. **Hence statement 3 is correct.**
- There is no natural habitat on earth that is inhabited only by a single species and such a situation is even inconceivable. For any species, the minimal requirement is one more species on which it can feed. Even a plant species, which makes its own food, cannot survive alone; it needs soil microbes to break down the organic matter in soil and return the inorganic nutrients for absorption. **Hence statement 2 is correct.**

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Q 40.C

- The Central Asian Flyway (CAF) covers a large continental area of Eurasia between the Arctic and Indian Oceans and the associated island chains.
- The Flyway comprises several important migration routes of waterbirds, most of which extend from the northernmost breeding grounds in the Russian Federation (Siberia) to the southernmost non-breeding (wintering) grounds in West and South Asia, the **Maldives** and the British Indian Ocean Territory.
- The birds on their annual migration cross the borders of several countries. Geographically the flyway region covers 30 countries of North, Central and South Asia and Trans-Caucasus.
- **There is an overlap between the CAF and the area of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), which was concluded in 1995, at The Hague, the Netherlands**.
    - India has a strategic role in the flyway, as it provides critical stopover sites to over 90% of the bird species known to use this migratory route.
    - **The Central Asian Flyway (CAF), one among the nine flyways identified under Convention on Migratory Species. Hence statement 1 is correct.**
- CAF migration routes include the **steppes and cold deserts of Central Eurasia**, and much of the Himalayan chain, where unique, high-altitude migrations such as those of the Bar-headed Goose, Anser indicus, take place. **Hence statement 2 is correct.**
- Other Central Asian species for which the new CAF Action Plan should have the greatest significance are: Asiatic Dowitcher (Limnodromus semipalmatus), Black-necked Crane (Grus nigricollis), Indian Skimmer (Rynchops albicollis), Ibisbill (Ibidorhyncha struthersii), Brown-headed Gull (Larus brunnicephalus), Siberian Crane (Leucogeranus leucogeranus), Sociable lapwing (Vanellus gregarius), Spot-billed Pelican (Pelecanus philippensis), Relict Gull (Larus relictus), Black-winged Pratincole (Glareola nordmannii) and Caspian Plover (Charadrius asiaticus).

Q 41.A

- **Recently, the volume of India's soft loans to neighboring countries has increased from about $3 billion to almost $15 billion in the last eight years.**
- **A soft loan is a loan with no interest or a below-market rate of interest.** Also known as **"soft financing" or "concessional funding,"** soft loans have lenient terms, such as extended grace periods in which only interest or service charges are due, and interest holidays. They typically offer longer amortization schedules (in some cases up to 50 years) than conventional bank loans.
- Soft loans are often made by multinational development banks (such as the Asian Development Fund), affiliates of the World Bank, or federal governments (or government agencies) to developing countries that would be unable to borrow at the market rate.
- Soft loans are often offered not only as a way to support developing nations but also to form economic and political ties with them. This often happens if the borrowing nation has a resource or material that is of interest to the lender, which may want not only repayment of the loan but favorable access to that resource.
- **Hence option (a) is the correct answer.**

Q 42.C

- **Birsa Munda's (Bhagwan Birsa Munda or Dharti Aaba) birth anniversary(15 Nov) is observed as Janjatiya Gaurav Divas.** He was born in Munda tribe Of Chotanagpur Plateau (Jharkhand).
- **Contributions:**
    - He fought against exploitation of local tribes by British and Zamindars, called as Dikus.
    - He started Birsait sect to end religious conversions and mobilised tribal community against British, called **'Munda Rebellion'.**
    - **He started a movement called 'Ulgulan', or 'The Great Tumult' against exploitation of tribals by local authorities.**
    - **The movement resulted in Chhotanagpur Tenancy Act of 1908, recognising tribal Khuntkatti rights and banned beth begari.**
- **Hence option (c) is the correct answer.**

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Q 43.C

- A constant input of solar energy is the basic requirement for any ecosystem to function and sustain. Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis.
- The rate of biomass production is called productivity.
  - It can be divided into gross primary productivity (GPP) and net primary productivity (NPP).
  - **Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis.**
  - A considerable amount of GPP is utilised by plants in respiration. Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP).
  - **GPP – R = NPP**
  - Net primary productivity is the available biomass for the consumption to heterotrophs (herbiviores and decomposers). **Hence statement 1 is correct.**
- Secondary productivity is defined as the rate of formation of new organic matter by consumers.
- Primary productivity depends on the plant species inhabiting a particular area. It also depends on a variety of environmental factors, availability of nutrients and photosynthetic capacity of plants. Therefore, it varies in different types of ecosystems. **Hence statement 2 is correct.**

Q 44.C

- Section 36A of the Wildlife Protection Act mentions the declaration and management of a conservation reserve.
- It states that the State Government may, after having consultations with the local communities, declare **any area owned by the Government, particularly the areas adjacent to National Parks and sanctuaries and those areas which link one protected area with another, as a conservation reserve** for protecting landscapes, seascapes, flora and fauna, and their habitat.
- It also states that where the conservation reserve includes any **land owned by the Central Government**, its prior concurrence shall be obtained before making such declaration. **Hence statement 1 is correct and statement 2 is not correct.**
- Conservation reserve management committee:
  - The State Government shall constitute a conservation reserve management committee to **advise the Chief Wild Life Warden to conserve, manage and maintain the conservation reserve. Hence statement 3 is correct.**
  - The committee shall consist of a representative of the forest or Wild Life Department, who shall be the Member-Secretary of the Committee, one representative of each Village Panchayat in whose jurisdiction the reserve is located, three representatives of non-governmental organizations working in the field of wildlife conservation and one representative each from the Department of Agriculture and Animal Husbandry.
  - The Committee shall regulate its own procedure including the quorum.

Q 45.C

- Differences in altitude make a primate species in the same Himalayan habitat choose between flowers and fruits as food options beyond their staple menu of leaves, a **new study** has revealed.
- The **Himalayan Gray Langur or the Chamba Sacred Langur (Semnopithecus ajax) is a colobine, meaning leaf-eating monkey. Hence statement 1 is correct.**
- **It is considered an endangered species globally as its population is estimated to be less than 1,500 mature individuals in 15-20 groups. Hence statement 2 is correct.**
- Three primatologists studied the diet composition of five such groups in and around the Kalatop-Khajjiar Wildlife Sanctuary in Himachal Pradesh between September and November 2020. They especially concentrated on two groups, one inhabiting the Kalatop forest at an average altitude of 2,396 metres, and the other based in the Khajjiar forest at an average altitude of 2,188 metres.

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Q 46.A

- The Sundarbans contain the **world's largest mangrove forests** and one of the most biologically productive of all natural ecosystems. Also, it is the **only mangrove forest inhabited by tigers. Hence, statement 1 is correct**.
- Located at the mouth of the Ganges and Brahmaputra Rivers between India and Bangladesh, its forest and waterways support a wide range of' fauna including a number of species threatened with extinction.
- The Indian Sundarban, also a UNESCO world heritage site is home to the Royal Bengal Tiger. The Ramsar website points out that the Indian Sundarban is also home to a large number of "rare and globally threatened species, such as the critically endangered northern river terrapin (Batagur baska), the **endangered Irrawaddy dolphin** (Orcaella brevirostris), and the **vulnerable fishing cat (**Prionailurus viverrinus)." **Hence, statement 2 is correct.**
- The fishing cat (Prionailurus viverrinus) is a medium-sized wild cat from South and Southeast Asia. Since 2016, it is listed as **Vulnerable on the IUCN Red List.** Fishing cat populations are threatened by the destruction of wetlands and have declined severely over the last decade. The fishing cat lives foremost in the vicinity of wetlands, along rivers, streams, oxbow lakes, swamps, and mangroves.
- The fishing cat is the state animal of West Bengal.
- The **Montreux Record is a register of wetland sites on the List of Wetlands of International Importance** where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution, or other human interference. It is maintained as part of the Ramsar List. In India, only two wetlands of India are in the Montreux record: Keoladeo National Park (Rajasthan) and Loktak Lake (Manipur). **Hence statement 3 is not correct.**

Q 47.B

- **Neelakurinji flowers:**
  - It is a shrub found in the **shola forests of the Western Ghats in Kerala, Karnataka, and Tamil Nadu. Hence, statement 1 is not correct.**
  - Locally known as Kurinji, the flowers grow at an altitude of 1,300 to 2,400 meters.
  - Nilgiri Hills, which literally means the blue mountains, got their name from the purplish blue flowers of Neelakurinji that **bloom only once in 12 years. Hence, statement 2 is correct.**
  - Kurinjimala Sanctuary of Kerala protects the kurinji in approximately 32 km2 core habitat in Kottakamboor and Vattavada villages in Idukki district.
  - Kurinji Andavar temple in Kodaikanal of Tamil Nadu dedicated to Tamil God Murugan also preserves these plants.
  - The Paliyan tribal people living in Tamil Nadu used it as a reference to calculate their age.
  - Karnataka has around 45 species of Neelakurinji and each species blooms at intervals of six, nine, 11, or 12 years.
  - Besides the Western Ghats, Neelakurinji is also seen in the Shevroy in the Eastern Ghats, Sanduru hills of Bellary district in Karnataka.

Q 48.A

- **Recently, as per reports, India raised objections to discussions under KJWA.** The Koronivia Joint Work on Agriculture (KJWA) is a landmark decision (decision 4/CP.23) recognizing the unique potential of agriculture in tackling climate change.
- The KJWA was established at the **23rd Conference of the Parties (COP) in Fiji in 2017** as a new process to advance discussions on agriculture in the United Nations Framework Convention on Climate Change (UNFCCC). **Hence statement 2 is not correct.**
- Under the leadership of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) and Subsidiary Body for Implementation (SBI), and in conjunction with ten Constituted Bodies of the Convention, countries agreed to work together to make sure that agricultural development ensures both increased food security in the face of climate change and a reduction in emissions.
- The joint work will address six topics related to soils, nutrient use, water, livestock, methods for assessing adaptation, and the socio-economic and food security dimensions of climate change across the agricultural sectors.

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- **The KJWA is the only programme to focus on agriculture and food security under UNFCCC. Hence statement 1 is correct.**
- The KJWA complements country Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs) and the Enhanced Transparency Framework (ETF) under the Paris Agreement, while contributing to the overall achievement of the Sustainable Development Goals (SDGs).

Q 49.A

- Protected areas are those in which human occupation or at least the exploitation of resources is limited. The definition that has been widely accepted across regional and global frameworks has been provided by the International Union for Conservation of Nature (IUCN) in its categorization guidelines for protected areas.
- The Wild Life (Protection) Act of 1972 provides for four kinds of protected areas: National Parks, Wildlife Sanctuaries, Conservation reserves and community reserves.
- Tiger Reserves are notified by State Governments as per provisions of Section 38V of the Wildlife (Protection) Act, 1972 on the advice of the National Tiger Conservation Authority.
- **Under the Wild Life (Protection) Act**
  - **No alteration of boundaries of a wildlife sanctuary can be made except on the recommendation of the National Board for wildlife. Hence, statement 1 is correct.**
  - **No alteration in the boundaries of a tiger reserve shall be made except on a recommendation of the Tiger Conservation Authority and the approval of the National Board for Wild Life. The National Tiger Conservation Authority recommends but the power of approval rests with the National Board for Wildlife. Hence, statement 2 is not correct.**

Q 50.B

- Community Reserves were added to the Wildlife Protection Act, of 1972 by the 2002 amendment.
- Section 36C of the Act talks about the declaration and management of community reserves.
- It states that the **State Government** may, where the community or an individual has volunteered to conserve wildlife and its habitat, declare any **private or community land not comprised within a National Park, sanctuary or conservation reserve, as a community reserve**, **for protecting fauna, flora and traditional or cultural conservation values and practices. Hence statement 1 is not correct and statement 2 is correct.**
- **Hence statement 3 is correct.**
- No change in the land use pattern shall be made within the community reserve, except in accordance with a resolution passed by the management committee and approval of the same by the State Government.
- Community Reserve management committee:
  - The State Government shall constitute a Community Reserve management committee, which shall be the authority responsible for conserving, maintaining and managing the community reserve.
  - The committee shall consist of **five representatives nominated by the Village Panchayat** or where such Panchayat does not exist by the members of the Gram Sabha and one representative of the State Forests or Wild Life Department under whose jurisdiction the community reserve is located.
  - The committee shall be the competent authority to prepare and implement the management plan for the community reserve and to take steps to ensure the protection of wild life and its habitat in the reserve.
  - The committee shall elect a Chairman who shall also be the Honorary Wild Life Warden on the community reserve.
  - The committee shall regulate its own procedure including the quorum.

Q 51.B

- The cheetah is a prominent cat family member that belongs to the subfamily feline and is found across Africa and some parts of Iran. The cheetah prefers grassland habitats where it has enough space to go after its prey without any obstacles.
- **According to the International Union for Conservation of Nature (IUCN), today African cheetahs are mainly present in southern African countries such as Algeria, Botswana, the Central African Republic, Ethiopia, Kenya, South Africa, and Zimbabwe, among others. The African Cheetahs are found in desert regions near Kalahari, Delta region, and grasslands. Iran is the only country having the Asiatic cheetah.** The Asiatic cheetah mainly inhabits the desert areas around Dasht-e Kavir in the eastern half of Iran. **Hence, statement 2 is correct.**

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- **The Asiatic cheetah is slightly smaller and more slender than the African cheetah.** The neck is much smaller and longer. An Asiatic cheetah adult grows to about 53 inches in length with a 33-inch tail and can weigh up to 119 pounds. African cheetahs, on the other hand, have a slightly bigger build with sturdier legs and necks. Their heads are also bigger compared side by side with the Asiatic cheetahs. An adult African cheetah can reach 84 inches in length and can weigh up to 159 pounds. **Hence, statement 1 is not correct.**
- **Under 'Project Cheetah', the Central government is "re-introducing" eight African cheetahs – five females and three males -- at the Kuno National Park in Madhya Pradesh. Hence, statement 3 is not correct.**

Q 52.A

- Indian Forests Act, of 1927 mentions the declaration of Village Forests.
- **It states that the State Government may assign to any village community the rights (management of village forests, forest produce, etc) of Government to or over any land which has been constituted a reserved forest and may cancel the such assignment. All forests so assigned shall be called village forests.**
- The State Government may make rules for regulating the management of village forests, prescribing the conditions under which the community to which any such assignment is made may be provided with timber or other forest produce or pasture, and their duties for the protection and improvement of such forest.
- All the provisions of this Act relating to reserved forests shall (so far as they are not inconsistent with the rules so made) apply to village forests.
- **Hence option (a) is the correct answer.**

Q 53.D

- **Ecosystem accounting is a coherent framework for integrating measures of ecosystems and the flows of services from them with measures of economic and other human activity. Hence option (d) is the correct answer.**
- Ecosystem accounting complements, and builds on, the accounting for environmental assets as described in the System of Environmental-Economic Accounting (SEEA) Central Framework (e.g. water resources, soil resources).
    - In ecosystem accounting as described in the SEEA Ecosystem Accounting (SEEA EA), the accounting approach recognises that these individual resources function in combination within a broader system and within a given spatial area.
- **It is an approach that can help answer questions such as:**
    - What is the contribution of ecosystems and their services to the economy, social wellbeing, jobs and livelihoods?
    - How is the condition, health and integrity of ecosystems and biodiversity changing over time and where are the main areas of degradation and enhancement?
    - How can natural resources and ecosystems be best managed to ensure continued services and benefits such as energy, food supply, water supply, flood control, carbon storage and recreational opportunities?
    - What are the trade-offs among different land uses (e.g. for agriculture, mining, housing development, habitat conservation, recreation) to achieve long-term sustainability and equity?
- **The System of Environmental Economic Accounting (SEEA):**
    - It organizes and presents statistics on the environment and its relationship with the economy.
    - The SEEA is a statistical system that brings together economic and environmental information into a common framework to measure the condition of the environment, the contribution of the environment to the economy and the impact of the economy on the environment.
    - The SEEA contains an internationally agreed set of standard concepts, definitions, classifications, accounting rules and tables to produce internationally comparable statistics.
    - India is one of 90 countries that have successfully adopted the ecosystem accounting system including the new framework for SEEA EA.

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Q 54.B

- A keystone species is an organism that helps define an entire ecosystem. Without its keystone species, the ecosystem would be dramatically different or cease to exist altogether.
- Keystone species not only maintain but also help reduce threats to biodiversity through its various ecosystem services.
- **The concept of functional redundancy implies that species loss is compensated by other species contributing similarly to functioning. Keystone species have low functional redundancy.** This means that if the species were to disappear from the ecosystem, no other species would be able to fill its ecological niche. The ecosystem would be forced to radically change, allowing new and possibly invasive species to populate the habitat and reducing its biodiversity. **Hence, statement 1 is not correct.**
- **Keystone mutualists are two or more species that engage in mutually beneficial interactions. A change in one species would impact the other, and change the entire ecosystem. Keystone mutualists are often pollinators, such as bees. Pollinators often maintain gene flow and dispersal throughout widespread ecosystems. Hence, statement 2 is correct.**

Q 55.D

- **Recently researchers are looking for possibilities regarding nanoparticles treating cancer.**
- Nanomaterials (particles less than 100nm in length) based cancer treatment help alter drug toxicity profile with enhanced surface characteristics to deliver an optimal concentration of drugs at tumour sites.
- Conventional therapies face challenges in delivery of drugs and also cause unwanted side effects due to toxic nature and higher doses of medicines.
- Nanomaterials hold significant promise to improve disease diagnosis and treatment based on their unique features, such as their: Higher surface to mass ratio to other particles, Quantum properties, Ability to adsorb and carry other compounds.
- **Advantages of nanomaterials in drug delivery**
    - **Allow targeted and efficient delivery** as nanostructures are able to penetrate tissues and are easily taken up by cells. **Hence statement 1 is correct.**
    - **Enables delivery of drugs that are poorly water soluble. Hence statement 2 is correct.**
    - Remain in blood circulation for a long time, **releasing incorporated drug in a controlled fashion**. **Hence statement 3 is correct.**
    - Concerns related to use of Nanomaterials: difficult to distinguish toxicity of drug from that of the nanoparticle, **nanoparticle-based drugs may increase toxicity in other organs** etc. **Hence statement 4 is not correct.**

Q 56.B

- Tamil Nadu notified India's first-ever dugong conservation reserve in the Palk Bay area of the Gulf of Mannar, which lies between Sri Lanka and the southern tip of India.
- **Dugongs are protected in India and occur in the Gulf of Mannar, Palk Bay, the Gulf of Kutch, and the Andaman and Nicobar islands. Hence, statement 1 is not correct.**
- Dugong (Dugong dugon) also called as 'Sea Cow' is one of the four surviving species in the Order Sirenia and **it is the only existing species of herbivorous mammal that lives exclusively in the sea including in India. Hence, statement 2 is not correct.**
- Recently, it is seen that, despite being **protected under Schedule 1 of the Wildlife Protection Act of 1972**, its population is decreasing. The dugong population has now reduced to about 200 individuals and is believed to be continuously declining in number and range. **Hence, statement 3 is correct.**
- Dugongs are threatened by seagrass habitat loss or degradation because of coastal development or industrial activities that cause water pollution.
- Apart from that, **Gill nets are also threatening the Dugong population. Being mammals, dugongs have to surface every three or four minutes to breathe. However, fishermen often set out gill nets at night in the shallow waters. Surfacing dugongs get tangled in the nets and die.**

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Q 57.A

- Recent context: Nearly half of the unique Longwood Shola forest in Kotagiri, which has received The Queens of Commonwealth Canopy (QCC) accreditation, is allegedly dominated by invasive species. The Longwood Shola is a primeval tract of forest within the town of Kotagiri.
  - Species such as Eucalyptus, Wattle (Acacia), introduced from Australia, have become highly invasive.
  - Acacias have almost replaced the grasslands in the Nilgiris, which sustained cattle for centuries.
  - The government introduced acacia in the region after India stopped importing tannin from Africa in the 1960s. Tannin, found in the bark, pods and leaves of acacia, is an organic substance used for preserving leather.
  - **Hence option (a) is the correct answer.**

Q 58.B

- **SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) scheme** is a Central Sector Scheme of MoPR.
  - **It aims to provide a 'Record of Rights (RoR)' to household owners in rural areas and issue Property Cards.**
  - **RoR is a legal document that gives details about the land and who owns it.**
  - The Scheme has been approved for five years- 2020-25.
- **Objectives of SVAMITVA scheme**
  - **Create accurate land records for rural planning** and reduce property-related disputes.
  - Bring financial stability in rural India by enabling use of property as a financial asset for taking loans etc.
  - Support preparation of Gram Panchayat Development Plan using GIS maps.

Q 59.B

- The Indian Forest Act, of 1927 is an Act to consolidate the law relating to forests, the transit of forest produce, and the duty leviable on timber and other forest produce. It also explains the procedure to be followed for declaring an area as Reserved Forest, Protected Forest, or Village Forest. This act has details of what a forest offense is, what acts are prohibited inside a Reserved Forest, and penalties leviable on violation of the provisions of the Act. After the Forest Act was enacted in 1865, it was amended twice (1878 and 1927).
- **Reserved Forests:** Reserve forests are the **most restricted forests and are constituted by the State Government** on any forest land or wasteland which is the property of the Government, or over which the Government has proprietary rights. **Hence statement 1 is not correct.** In reserved forests, local people are prohibited, unless specifically allowed by a Forest Settlement Officer in the course of the settlement.
- **Protected Forests:** The State Government is empowered to constitute any forest-land or waste-land other than reserved forests as protected forests over which the Government has proprietary rights or property of Government and the power to issue rules regarding the use of such forests.
- The total area of Reserved Forests (RFs) in India is 4,42,276 sq km or 13.45% of India's land area. The total area of Protected Forests in India is 2, 12, 259 sq km. **Hence statement 2 is correct.**
- **Every state** and all union territories (except Lakshadweep and Puducherry) in India have reserved forests. Madhya Pradesh has the highest area classified as a reserved forest (61, 886 sq km). **Hence statement 3 is correct.**

Q 60.D

- The movement of nutrient elements through the various components of an ecosystem is called nutrient cycling. Another name of nutrient cycling is biogeochemical cycles (bio: living organism, geo: rocks, air, water).
- Nutrient cycles are of two types: gaseous and sedimentary.
  - The reservoir for gaseous type of nutrient cycle (e.g., nitrogen, carbon cycle) exists in the atmosphere and for the sedimentary cycle (e.g., sulphur and phosphorus cycle), the reservoir is located in Earth's crust. **Hence statement 2 is not correct.**

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- Environmental factors, e.g., soil, moisture, pH, temperature, etc., regulate the rate of release of nutrients into the atmosphere.

- Most gaseous cycles are generally considered perfect cycles because in sedimentary cycles, some nutrients are lost from the cycle and get locked into sediments, and so become unavailable for immediate cycling. **Hence statement 1 is not correct.**

Q 61.B

- Speciation is how a new kind of plant or animal species is created.
- There are five types of speciation: allopatric, peripatric, parapatric, and sympatric and artificial.
  - **Allopatric speciation:**
    - It occurs when a species separates into two separate groups which are isolated from one another. A physical barrier, such as a mountain range or a waterway, makes it impossible for them to breed with one another. Each species develops differently based on the demands of their unique habitat or the genetic characteristics of the group that are passed on to offspring.
  - **Peripatric speciation:**
    - When small groups of individuals break off from the larger group and form a new species, this is called peripatric speciation.
    - The main difference between allopatric speciation and peripatric speciation is that in peripatric speciation, one group is much smaller than the other. Unique characteristics of the smaller groups are passed on to future generations of the group, making those traits more common among that group and distinguishing them from the others. **Hence option (b) is the correct answer.**
  - **Parapatric speciation:**
    - In parapatric speciation, a species is spread out over a large geographic area. Although it is possible for any member of the species to mate with another member, individuals only mate with those in their own geographic region. Like allopatric and peripatric speciation, different habitats influence the development of different species in parapatric speciation. Instead of being separated by a physical barrier, the species are separated by differences in the same environment.
  - **Sympatric Speciation:**
    - Sympatric speciation is controversial. Some scientists don't believe it exists.
    - It occurs when there are no physical barriers preventing any members of a species from mating with another, and all members are in close proximity to one another. A new species, perhaps based on a different food source or characteristic, seems to develop spontaneously. The theory is that some individuals become dependent on certain aspects of an environment—such as shelter or food sources—while others do not.
  - **Artificial Speciation:**
    - Artificial speciation is the creation of new species by people. This is achieved through lab experiments, where scientists mostly research insects like fruit flies.

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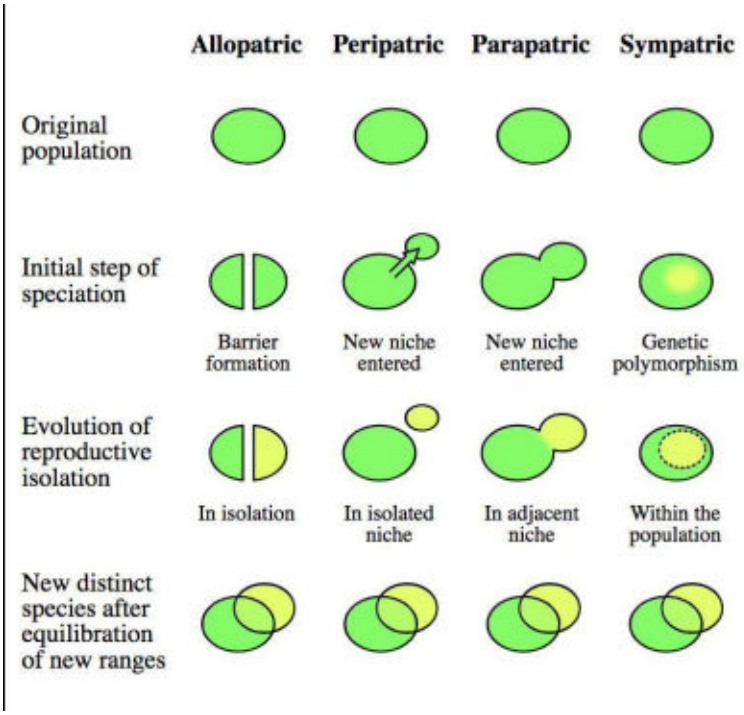

Q 62.D

- An area, whether within a sanctuary or not, can be notified by the state government to be constituted **as a National Park**, by reason of its ecological, faunal, floral, geomorphological, or zoological association or importance, needed to for the purpose of protecting & propagating or developing wildlife therein or its environment. No human activity is permitted inside the national park except for the ones permitted by the Chief Wildlife Warden of the state under the conditions given in Chapter 4 of the Wildlife Protection Act, 1972.
- There are **106 existing national parks** in India covering an area of **44,372.42 km2, which is 1.35% of the geographical area of the country** (National Wildlife Database, May. 2022).
- **Mudumalai National Park**: Mudumalai National Park is a national park in the Nilgiri Mountains in Tamil Nadu, south India. It covers 321 km2 (124 sq mi) at an elevation range of 850–1,250 m (2,790–4,100 ft) in the Nilgiri District and shares boundaries with the states of Karnataka and Kerala. A part of this area has been protected since 1940. The national park has been part of the Nilgiri Biosphere Reserve since 1986 and was declared a tiger reserve together with a buffer zone of 367.59 km2 (141.93 sq mi) in 2007. It receives an annual rainfall of about 1,420 mm (56 in) and harbors tropical and subtropical moist broadleaf forests with 498 plant species, at least 266 bird species, 18 carnivores,s and 10 herbivore species. It is drained by the Moyar River and several tributaries, which harbor 38 fish species. **Hence pair 1 is not correctly matched.**
- **Neora Valley National Park**: Neora Valley National Park is a national park in Kalimpong district, **West Bengal, India** that was established in 1986. It spreads over an area of 88 km2 (34 sq mi),[1] and is a rich biological zone in eastern India. It is the land of the red panda in the pristine undisturbed natural habitat with rugged inaccessible hilly terrain and rich diverse flora and fauna. It is linked to the Pangolakha Wildlife Sanctuary of Pakyong District as well as the forests of Samtse District, Bhutan via a thick cover of forests. **Hence pair 4 is not correctly matched.**
- **Sirohi National Park:** Sirohi National Park is a national park located in the state of **Manipur** in India. It was established in 1982. Among the animals that make their homes here include leopards, etc. It is here that the famous shirui lily (Lilium mackliniae) grows naturally. The main peak of Siroy abounds with flowers during the monsoon and it is a veritable paradise.
- **This is not to be confused with Sirohi city:** Sirohi is a city, located in Sirohi district in southern Rajasthan state in western India. It is the administrative headquarters of Sirohi District and was formerly the capital of the princely state of Sirohi ruled by Deora Chauhan Rajput rulers. **Hence pair 2 is not correctly matched.**

- **Dudhwa National Park**: The Dudhwa National Park is a national park in the Terai belt of marshy grasslands in northern Uttar Pradesh, India. It stretches over an area of 490.3 km2 (189.3 sq mi), with a buffer zone of 190 km2 (73 sq mi). It is part of the Dudhwa Tiger Reserve in the Kheri and Lakhimpur districts. The park is located on the Indo-Nepali border in the Lakhimpur Kheri District and has buffers of reserved forest areas on the northern and southern sides. It represents one of the few remaining protected areas of the diverse and productive Terai ecosystem, supporting many endangered species, obligate species of tall wet grasslands, and species of restricted distribution. **Hence pair 3 is correctly matched.**

Q 63.B

- **According to a PTI report, Indian Prime Minister presented US President Joe Biden with Kangra miniature paintings; UK PM Rishi Sunak with 'Mata Ni Pachedi', a handmade Gujarat textile offered in temples; 'Pithora', a tribal folk art from Chhota Udaipur, to Australian leader Anthony Albanese; agate bowls from Kutch to the leaders of France, Germany and Singapore; and a 'Patan Patola' scarf to his Italian counterpart Giorgia Meloni.**
- Patan Patola has recieved the Geographical Indication tag from **Gujarat. Hence statement 1 is not correct.**
- It is an **ancient art of double ikat or Patola woven in pure silk.** It dates to the 11th century from the area of Patan in North Gujarat. It is dyed with natural extracts of marigold, onion skin, pomegranate, etc. **Hence statement 2 is correct.**
- The peculiar quality has its origins in a very intricate and difficult technique of Tie dyeing or Knot dyeing known as "Bandhani Process" on the wrap & weft separately before weaving. Before World War II, Indonesia was major buyer of patolas. Historically, the art of Double Ikat patola weaving dates back to centuries. Paintings in Ajanta caves resemble the tie-dye technique of patola.
- Legend indicates that sometimes in the 12th Century AD, **King Kumarpal of Solanki dynasty, invited 700 families of patola weavers from Jalna (South Maharashtra) to settle down in Patan in North Gujarat. Hence statement 3 is correct.**

Q 64.C

- **Recently, United Nations Environment Programme (UNEP) released the Adaptation Gap Report, 2022. Hence option (c) is the correct answer.**
- It is an annual publication that looks at progress in planning, financing, and implementing adaptation actions.
- The adaptation gap is the difference between actually implemented adaptation and a goal set by society, determined largely by preferences related to climate change impacts.
- **Other important reports by UNEP:**
  - Emissions Gap Report 2022
  - An Eye on Methane: International Methane Emissions Observatory 2022 Report
  - 2022 Global Status Report for Buildings and Construction: The Global Status Report for Buildings and Construction (Buildings-GSR) is a flagship publication of the UNEP-hosted Global Alliance for Buildings and Construction (GlobalABC).
  - Global Methane Assessment 2030: Baseline Report

Q 65.B

- Seagrasses are underwater plants that evolved from land plants. **They are like terrestrial plants in that they have leaves, flowers, seeds, roots, and connective tissues, and they make their food through photosynthesis. Hence statement 1 is not correct.**
  - Unlike terrestrial plants, however, they do not have strong stems to hold themselves up—instead, they're supported by the buoyancy of the water that surrounds them.
  - They grow submerged in shallow marine waters like bays and lagoons.
  - They are distributed from the tropics to the arctic circle. Antarctica is the only continent without seagrasses.

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- Though seagrasses inhabit all types of substratas (layers) from mud to rock, the lush green seagrass beds are found extensively in muddy and sandy substratas.
- **Seagrasses occur all along the coastal areas of India. They are abundant in the Palk Strait and Gulf of Mannar in Tamil Nadu. Hence statement 2 is correct.**
- Seagrasses reproduce through both sexual and asexual methods. The pollen from the flower of the male plant is transferred to the ovary of the female flower through the sexual reproduction method. This is known as submarine pollination. Most species undergo this process and complete their life cycle underwater.
- Some endangered marine organisms like dugong, green turtle, etc, graze directly on seagrass leaves.

Q 66.A

- **Indian Veterinary Research Institute (IVRI) has demanded a ban on using aceclofenac in cattle after a new study showed that the drug metabolizes into diclofenac in water buffaloes — as it does in cows.**
- Aceclofenac is a nonsteroidal anti-inflammatory drug (NSAID) analog of diclofenac. It is used for the relief of pain and inflammation in rheumatoid arthritis, osteoarthritis and ankylosing spondylitis.
- **Aceclofenac is a veterinary painkiller. Recent studies have shown that aceclofenac almost immediately converts to diclofenac inside cattle and buffalo.**
- It severely threatens vultures that feed on the carcasses of any recently treated animals, said Pawde, who is also the principal scientist and in charge of IVRI.
- Diclofenac — an anti-inflammatory drug — was banned for veterinary use by the Government of India in 2006. It was found to be the main cause of a dramatic decline (99 percent) of the vulture population across Asia.
- **Hence option (a) is the correct answer.**

Q 67.A

- **The World Economic Forum recently published the report named "BiodiverCities by 2030: Transforming cities" which studies the cities' relationship with nature.**
- The report is a product of the initiative named "BiodiverCities by 2030" which is a joint initiative of the World Economic Forum and the Alexander von Humboldt Institute, championed by the Government of Colombia. This initiative aims to support city governments, businesses and citizens, to enable cities to live in harmony with nature by 2030.
- This report builds on the work of the World Economic Forum's New Nature Economy Report series, which identified nature-related economic risks (affecting more than half the world's GDP) and opportunities from nature-positive pathways, including an increase in business value by $10.1 trillion and the creation of 395 million jobs by 2030.
- BiodiverCities can restore the balance between cities and nature by improving urban governance models to support by mainstreaming biodiversity data in a decision-making and adopting a systems approach to urban governance.
- **Hence option (a) is the correct answer.**

Q 68.C

- As the world struggles to reduce greenhouse gas emissions and achieve mitigation targets, greenwashing is a factor being recognized as one that threatens to undermine the global effort toward Net Zero.
- Simply put **greenwashing is when an entity spends a lot of its money and energy in proclaiming to be environmentally compliant than actually minimizing its environmental footprint.** It is an exercise to hoodwink consumers or stakeholders that an organization is offering a green product or service.
- **Carbon offsetting is considered greenwashing when companies do not prioritize in-house emissions reductions, double-count carbon credits, or invest in non-verified credits.** Companies engaging in carbon offsetting can be divided into three levels zero, moderate, and severe greenwashing.
- **Hence option (c) is the correct answer.**

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Q 69.C

- **The Reserve Bank of India (RBI) launched digital rupee, or e-rupee, to settle secondary market transactions in government securities.**
- Digital rupee or Central Bank Digital Currency (CBDC) is legal tender issued by RBI in digital form. It will be referred as e₹ (digitalRupee).
- E-rupee is the same as a fiat currency and is exchangeable one-to-one with the fiat currency. Only its form is different.
- It can be accepted as a medium of payment, legal tender and a safe store of value. **Hence statement 1 is correct.**
- The digital rupee would appear as liability on a central bank's balance sheet. **Hence statement 2 is correct.**
- **Benefits of e-Rupee:**
  - The use of the e-rupee wholesale segment is expected to make the inter-bank market more efficient.
  - Settlement in central bank money would reduce transaction costs by pre-empting the need for settlement guarantee infrastructure or for collateral to mitigate settlement risk.
  - Going forward, other wholesale transactions, and cross-border payments will be the focus of future pilots, based on the learnings from this pilot phase
- CBDC can be classified into two types: Retail (e₹ -R): Potentially available for use by all and Wholesale (e₹ -W): for access to select financial institutions.
- Fiat money is a government-issued currency that is not backed by a commodity such as gold. Fiat money gives central banks greater control over the economy because they can control how much money is printed. Most modern paper currencies, such as the U.S. dollar, are fiat currencies.

Q 70.B

- Bengal Florican (Houbaropsis Bengalensis) is a rare bustard species that is very well known for its mating dance.
- **It is native to only 3 countries in the world - Cambodia, India, and Nepal. In India, it occurs in 3 States namely Uttar Pradesh, Assam, and Arunachal Pradesh.**
- **Ongoing conversion of the bird's grassland habitat for various purposes including agriculture is mainly responsible for its population decline.**
- At present in India, Bengal Florican survives only in a few protected pockets like Manas National Park, Kaziranga National Park, Orang National Park, Sonai-Rupai Wildlife Sanctuary, Dibru-saikhoa National Park, and Burachapori Wildlife Sanctuary in Assam, D'Ering Wildlife Sanctuary in Arunachal Pradesh, Jaldapara and Gorumara Wildlife Sanctuary in West Bengal and Dudwa National Park in Uttar Pradesh. **Hence, option (b) is the correct answer.**

Q 71.D

- **NASA completed the technology demonstration of its Low-Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID) mission.**
- **The "inflatable aerodynamic decelerator," or "aeroshell" technology could one day help land humans on Mars. Hence statement 1 is correct.**
  - Not only will this allow payloads that are much heavier, but it can also allow landings starting at higher altitudes.
  - Further, **it could also be used to bring back massive objects back from Earth's orbit, like items from the International Space Station. Hence statement 2 is correct.**
  - NASA says the technology could also potentially be used for **bringing back rocket assets after they are launched. Hence statement 3 is correct.**

Q 72.C

- More than 70 per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than 22 per cent of the total.
  - Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total. That means, out of every 10 animals on this planet, 7 are insects. The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles and mammals.

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- Biodiversity is a complex term that includes not only the variety of different animals (species diversity) but also the difference between animals of the same species (genetic diversity) and between ecosystems (ecosystem diversity). Biodiversity is measured by two major components:species richness and species evenness.
    - Species richness (S) is the number of species within a defined region.
    - Species evenness takes into account the number of species and the relative abundance of species in a community.
- Alpha diversity, sometimes referred to as point diversity, is the species richness that occurs within a given area within a region that is smaller than the entire distribution of the species.
- **Beta diversity is the rate at which species richness increases as one moves in a straight line across a region from one habitat to another habitat. In other words, it is the rate of change in species richness that occurs with a change in spatial scale. Hence statement 1 is correct.**
- Gamma diversity is the species richness within an entire region. In other words, it is a measure of the overall diversity of the different ecosystems within a region. **Hence statement 2 is correct.**
- Genetic diversity: A single species might show high diversity at the genetic level over its distributional range. India has more than 50,000 genetically different strains of rice, and 1,000 varieties of mango.
- Species diversity: The diversity at the species level, for example, the Western Ghats have a greater amphibian species diversity than the Eastern Ghats. The diversity index of **zero represents infinite diversity, and 'one' represents only one species present.**
- Ecological diversity: At the ecosystem level, India, for instance, with its deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway.

Q 73.A

- The taiga is a forest of the cold, subarctic region. The subarctic is an area of the Northern Hemisphere that lies just south of the Arctic Circle. The taiga lies between the tundra to the north and temperate forests to the south.
    - The taiga is nowhere in the southern hemisphere, since there is no mass of mainland at the appropriate latitudes. In the northern hemisphere, instead, the taiga forms an uninterrupted belt all around the world, from Scandinavia to Asian Siberia and Canada. **Hence statement 1 is correct.**
- The soil beneath the taiga often contains permafrost—a layer of permanently frozen soil. In other areas, a layer of bedrock lies just beneath the soil. Both permafrost and rock prevent water from draining from the top layers of soil. This creates shallow bogs known as muskegs. Muskegs can look like solid ground, because they are covered with moss, short grasses, and sometimes even trees. However, the ground is actually wet and spongy.
- Taigas are thick forests. Coniferous trees, such as spruce, pine, and fir, are common.
    - Coniferous trees have needles instead of broad leaves, and their seeds grow inside protective, woody cones. While deciduous trees of temperate forests lose their leaves in winter, conifers never lose their needles. For this reason, conifers are also called "evergreens." **Hence statement 2 is correct.**
- Taigas have few native plants besides conifers.
- The soil of the taiga has few nutrients. It can also freeze, making it difficult for many plants to take root. The larch is one of the only deciduous trees able to survive in the freezing northern taiga.
- Many kinds of animals live in the taiga. All animals have to be well-adapted to the cold. Birds native to the taiga usually migrate south during the freezing winter months. Small animals, mostly rodents, live close to the floor.
- Few large carnivorous animals live in the taiga. Bears and lynx are fairly common. The largest cat in the world, the 300-kilogram (660-pound) Siberian tiger, is a native taiga species. Siberian tigers live in a small part of eastern Siberia. They hunt moose and wild boars. **Hence statement 3 is correct.**

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Q 74.C

- **The Ministry of Jal Shakti released the Dynamic Ground Water (GW) Resource Assessment 2022 report.**
- India is the largest user of (Groundwater) GW with a fourth of total global withdrawal. **Hence statement 1 is correct.**
- The ground water resources are assessed in units i.e blocks/ talukas/ mandals/ watersheds. These assessment units are categorized for ground water development based on two criteria - a) stage of ground water development, and b) long-term of pre and post monsoon water levels.
- Recharge: Total annual GW recharge has increased (437.6 bcm) and rainfall contributes to nearly 61 % of this.
- Extraction: Stage of GW extraction (percentage of utilisation of groundwater against recharge) saw a decline reaching 60%.
- 87% of the GW was extracted for irrigation.
- GW extraction is very high (100%) in Haryana, Punjab, Rajasthan, Dadra & Nagar Haveli, and Daman & Diu.
- Categories under 3 category:
  - **Overexploited: Groundwater extraction exceeding the annually replenishable ground water recharge.**
  - **Critical: groundwater extraction is between 90-100 % of annual extractable resources available.**
  - **Safe: Groundwater extraction is less than 70%. Hence statement 2 is correct.**
- 67% GW units are safe and there was a decline in the number of over-exploited units.
- 14 % assessment units are 'Overexploited' and 4% are 'Critical'.

Q 75.C

- Union Minister for Commerce and Industry appreciated the Gujarat Government for spearheading several wide-ranging initiatives to promote the Lab Grown Diamonds Sector.
- The only difference between lab-grown diamond and natural diamond is that instead of digging the earth, it is created in a **lab under a machine. Lab-made diamonds are developed from a carbon seed placed in a microwave chamber and superheated into a glowing plasma ball.** The process creates particles that crystallise into diamonds in weeks. **Hence statement 1 is correct.**
- This tech-based manufacturing directly cuts down the capital and labour-intensive factors of the mined diamond chain and so lab-grown diamonds cost 30-40 percent cheaper (/topic/cheaper) than mined despite being 100 percent diamond.
- There are two types of lab-grown diamonds- chemical vapour decomposition (CVD) and High Pressure High Temperature (HPHT).
- **India particularly specialises and leads in CVD technology that is certified as purest type of diamonds.Hence statement 2 is not correct.**
- One of the incentives that the government had brought in is that it has **permitted 100 per cent foreign direct investment (FDI) in the sector under the automatic route.** Further, according to Budget 2019-20, the GST rate has been reduced from 18 percent to 5 percent. **Hence statement 3 is correct.**

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Q 76.D

- **Kashmir Saffron Festival, 2022 was organised on November 1 by the Department of Tourism, Jammu and Kashmir.**
- Saffron, the most expensive spice in the world is derived from the dry stigmata of the plant Crocus Sativus. The plant is a bulbous, perennial with globular corms, 15-20 cm high. It has 6 to 10 leaves present at anthesis, one to two flowers with a lilac-purple colour with perianth segments of 3.5 – 5 cm and style branches of 2.5 – 3.2 cm.
- **Saffron is a native of Southern Europe and cultivated in Mediterranean countries**, particularly in Spain, Austria, France, Greece, England, Turkey, Iran. **Hence statement 1 is correct.**
- In India, it is cultivated in Jammu & Kashmir and in Himachal Pradesh.
- Saffron thrives best in warm sub-tropical climate. **Hence statement 2 is correct.**
- In Spain, it is grown in dry temperate conditions with an annual rainfall below 40 cm. It grows at an elevation of 2000 mtrs MSL.
- **Photoperiod exerts a considerable influence in the flowering of saffron**. An optimum period of 11 hours of illumination is desirable. Unusually low temperature coupled with high humidity during the flowering season affects flowering of the crop. Spring rains boost production of new corms. Slightly acidic to neutral, gravelly, loamy, sandy soils are suitable for saffron cultivation. **Hence statement 3 is correct.**
- Kashmir saffron:
    - Kashmir saffron, which is cultivated and harvested in the **Karewa (highlands) of Jammu and Kashmir**, has been given the **Geographical Indication (GI) tag by the Geographical Indications Registry.** The spice is grown in some regions of Kashmir, including Pulwama, Budgam, Kishtwar and Srinagar.
    - The unique characteristics of Kashmir saffron are its longer and thicker stigmas, natural deep-red colour, high aroma, bitter flavour, chemical-free processing, and high quantity of crocin (colouring strength), safranal (flavour) and picrocrocin (bitterness).
    - It is the only saffron in the world grown at an altitude of 1,600 m to 1,800 m AMSL (above mean sea level), which adds to its uniqueness and differentiates it from other saffron varieties available the world over.
    - The saffron available in Kashmir is of three types — '**Lachha Saffron'**, with stigmas just separated from the flowers and dried without further processing; '**Mongra Saffron**', in which stigmas are detached from the flower, dried in the sun and processed traditionally; and '**Guchhi Saffron**', which is the same as Lachha, except that the latter's dried stigmas are packed loosely in air-tight containers while the former has stigmas joined together in a bundle tied with a cloth thread.
- Saffron cultivation is believed to have been introduced in Kashmir by Central Asian immigrants around 1st Century BCE. In ancient Sanskrit literature, saffron is referred to as '**bahukam'.**

Q 77.B

- As per IUCN definition, a hope spot is an area of an ocean that needs special protection because of its wildlife and significant underwater habitats. **Hence statement 2 is correct.**
    - Led by legendary oceanographer Sylvia Earle, Mission Blue is uniting a global coalition.
    - Mission Blue is a global coalition to create public awareness, to access and support for a worldwide network of Marine Protected Areas ie Hope Spots
    - The Aim of mission blue to create Hope Spots to increase the protection of ocean ecology.
- Mission Blue has partnered with the International Union for Conservation of Nature (IUCN) and receives support from National Geographic, Rolex, and Google.
- Hope Spot Network is a joint initiative of Mission Blue and International Union Of Conservation of Nature (IUCN). **Hence statement 1 is not correct.**
- Currently, there are a total of 76 Hope Spots around the world.
- Andaman and Nicobar Islands and Lakshadweep islands have recently been named as the new "hope spots" from India. In Lakshadweep group of islands, Pitti (0.01 square kilometre) is the only island that has marine protected areas (MPA) tag. **Hence statement 3 is correct.**
- About 12 per cent of land around the world is under some form of protection (as national parks, world heritage sites, monuments) while less than one per cent of the oceans is protected.

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Q 78.D

- Reef-building corals cannot tolerate water temperatures below 18° Celsius. Many grow optimally in water temperatures between 23°–29°Celsius, but some can tolerate temperatures as high as 40° Celsius for short periods.
- Most reef-building corals also require very saline water ranging from 32 to 42 parts per thousand.
- The water must also be clear so that a maximum amount of light penetrates it. This is because most reef-building corals contain photosynthetic algae, called zooxanthellae, which live in their tissues.
    - Corals require fairly good amount of sunlight to survive. Hence it requires shallow water but at some places it is also found in deep waters as well.
- Adequate supply of oxygen and microscopic marine food, called plankton is essential for the growth.
- Most reef-building corals contain photosynthetic algae, called zooxanthellae, that live in their tissues. **The coral provides the algae with a protected environment and compounds they need for photosynthesis.** In return, the algae produce oxygen and help the coral to remove wastes. Most importantly, zooxanthellae supply the coral with glucose, glycerol, and amino acids, which are the products of photosynthesis. The coral uses these products to make proteins, fats, and carbohydrates, and produce calcium carbonate.
    - This symbiotic relationship, called a mutualism, benefits both the corals and the algae.
    - Because of their intimate relationship with zooxanthellae, reef-building corals respond to the environment like plants. **But the zooxanthellae are fast growing plants where as corals are slow growing colonies of animals. Hence option (d) is the correct answer.**

Q 79.C

- **In-situ Conservation:** It means the conservation of wildlife in its natural habitat. It emphasizes the protection of the ecosystems of the original habitats or natural environment. Some of these are national parks, **wildlife sanctuaries**, Biosphere reserves, and sacred groves (like those in Khasi and Jaintia hills of Meghalaya). Thus options 2 and 3 are methods of in-situ preservation. **Hence options 2 and 3 are not correct.**
- **Ex situ Conservation:** In this approach, threatened animals and plants are taken out from their natural habitat and placed in a special setting where they can be protected and given special care. For example, Zoological parks, **botanical gardens**, wildlife safari parks, seed banks etc. **Cryopreservation** is also an ex-situ conservation technique.
- **Cryopreservation** is the only ex situ conservation method for the long-term preservation of species that cannot be stored in seed banks. Cryo-preservation or cryo-conservation is a process where organisms, organelles, cells, tissues, extracellular matrix, organs, or any other biological constructs susceptible to damage caused by unregulated chemical kinetics are preserved by cooling to very low temperatures.
- **Hence options 1 and 4 are correct.**

Q 80.C

- **The red-eared slider is native to the south-eastern USA and Mexico but has found its way across the globe including India through the trade of exotic animals. Hence statement 1 is correct.**
- In India, keeping indigenous turtles as pets is prohibited under the wildlife protection act. But the foreign breeds are not restricted and are kept as pets in many families across India.
- **Also, the species is not mentioned in the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Hence, statement 3 is correct.**
- The presence of invasive and non-native south red-eared slider turtles would lead to the extinction of native species of their own kind, according to experts.
- Effect on native species:
    - As they mature fast, grow larger, produce more offspring and are very aggressive, they can out-compete native turtles for food, nestling, and basking sites.
    - They eat plants and animals and can finish off a wide range of aquatic species, including fish and rare frogs.
    - They can also transfer diseases and parasites to native reptile species.
    - **The species is already spread across many Indian states and poses a threat to all species of its kind, including soft-shell and hard-shell turtles. Hence, statement 2 is correct.**

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Q 81.A

- **Precision Air flight with dozens of passengers aboard plunged into Lake Victoria while approaching the northwestern city of Bukoba.**
- Lake Victoria, also called Victoria Nyanza, largest lake in Africa and the chief reservoir of the Nile, lying mainly in **Tanzania and Uganda but bordering on Kenya.**
- Among the freshwater lakes of the world, it is exceeded in size only by Lake Superior in North America. It is an irregular quadrilateral in shape, and its shores, save on the west, are deeply indented.
- Its waters fill a shallow depression in the centre of the great plateau that stretches between the Western and Eastern Rift Valleys.
- **The Kagera River, the largest and most important of the lake affluents, enters the western side of Lake Victoria just north of latitude 1° S.** The only other river of note entering from the west is the Katonga, north of Kagera. **The lake's only outlet is the Victoria Nile, which exits from the northern coast.**
- **Hence option (a) is the correct answer.**

Q 82.C

- Climate change and global warming are two of the most direct threats to global biodiversity. It has a multifaceted impact on the lifecycle of many species around the globe. Some of the threats posed by global warming to biodiversity are:
    - **Reduced Reproduction and disease incidence on species**: Since frogs rely on water to breed, any reduction or change in rainfall could reduce frog reproduction. Moreover, rising temperatures are closely linked to outbreaks of a fungal disease that contributes to the decline of amphibian populations, especially frogs in Latin America.
    - **The gender imbalance of species:** Warmer temperatures in the Pacific regions could reduce the number of male sea turtle offspring and threaten turtle populations. The sex of sea turtle hatchlings is dependent on temperature, with warmer temperatures increasing the number of female sea turtles.
    - **Habitat destruction of species**: In the Arctic, shorter periods of sea ice coverage endanger the polar bear habitat and existence by giving them less time to hunt.
    - **Migration**: Higher temperatures have forced animals and plants to move to higher elevations or higher latitudes, many moving towards the Earth's poles, with far-reaching consequences for ecosystems as invasive species are introduced in these ecosystems which impact the food chain balance.
    - **Hence, option (c) is the correct answer.**

Q 83.D

- The programme of Biosphere Reserve was initiated under the 'Man & Biosphere' (MAB) programme by UNESCO in 1971.
- Biosphere Reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use.
- They are internationally recognized, nominated by National Governments and remain under sovereign jurisdiction of the states where they are located.
- Criteria for designation of BR
    - A site that must contain an effectively protected and minimally disturbed core area of value of nature conservation.
    - The core area should be typical of a bio-geographical unit and large enough to sustain viable populations representing all trophic levels in the ecosystem.
    - The management authority to ensure the involvement/cooperation of local communities to bring variety of knowledge and experiences to link biodiversity conservation and socio-economic development while managing and containing the conflicts.
    - Areas potential for preservation of traditional tribal or rural modes of living for harmonious use of the environment.

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- There are 18 Biosphere Reserves in the country.
    - The Dibru-Saikhowa Biosphere Reserve is the smallest and Kachchh Biosphere Reserve is the largest in terms of area. **Hence statement 1 and 2 are not correct.**
    - Agasthyamalai Biosphere Reserve is spread across Tamil Nadu and Kerala. Achanakamar-Amarkantak Biosphere Reserve is spread across Madhya Pradesh and Chhattishgarh. Rest all 15 Biosphere Reserves (except Nilgiri) lies in only one state. **Hence statement 3 is not correct.**
    - Nilgiri Biosphere Reserve is spread across Tamil Nadu, Kerala and Karnataka.

Q 84.C

- In ecology, the term "niche" describes the role an organism plays in a community.
    - It is the unique functional role and position of a species in its habitat or ecosystem.
    - **No two species in a habitat can have the same niche.**
    - A species' niche encompasses both the physical and environmental conditions it requires (like temperature or terrain) and the interactions it has with other species (like predation or competition). Ecological niches are found in all types of ecosystems.
    - It plays an essential role in the conservation of organisms. If we have to conserve species in their native habitat, we should know the niche requirements of the species.
- **Ecocline** is a zone of gradual but continuous change from one ecosystem to another when there is no sharp boundary between the two in terms of species composition. **Hence option (c) is the correct answer.**
    - The ecocline concept was used by vegetation ecologists describing ecological gradients, both spatial continua and time-series, eg. Wetland.
- An **ecotype is a population** (or subspecies or race) that is adapted to local environmental conditions. Thus, the adaptations of these ecotypes are based on the interactions of their own special sets of genes with their own environment. The population is a community of interbreeding organism occupying a defined area during a specific time.
- The population is a community of interbreeding organism occupying a defined area during a specific time.
    - Population growth rate can be positive due to birth and/or immigration or negative due to death and/or emigration.

Q 85.D

- Kaziranga National Park holds the most important population of elephants in Northeast India. Along with elephants, Kaziranga also houses tigers in one of the highest densities across their range; a majority of greater one-horned rhinoceros and eastern swamp deer; and a host of other species including the Asiatic water buffalo, hog deer, and many other mammals, migratory and resident birds, and flora. Kaziranga National is famous for the **Big Five namely the Rhinoceros, Tiger, Elephant, Asiatic Wild Buffalo, and Eastern Swamp Deer**.
- Kaziranga National Park is a UNESCO world heritage site. It is spread across the river Brahmaputra.
- In India, the geographical range of snow leopard encompasses a large part of the western Himalayas, including the Union Territories of Jammu and Kashmir and Ladakh, Himachal Pradesh, Uttarakhand and Sikkim, and Arunachal Pradesh in the eastern Himalayas. Hemis National Park, Gangotri National Park, Khangchendzonga National park, and Great Himalayan National Park are some protected areas where snow leopards are known to be found. **Hence, option (d) is the correct answer.**

Q 86.B

- **Kaziranga National Park** is a national park in the Golaghat and Nagaon districts of the state of Assam, India.
    - Spread over 430 square kilometer area sprinkled with elephant-grass meadows, swampy lagoons, and dense forests is home to more than 2200 Indian one-horned rhinoceros, approximately 2/3rd of their total world population.
    - Formed in 1908 on the recommendation of Mary Curzon, the park is located on the edge of the Eastern Himalayan biodiversity hotspot. In the year 1985, the park was declared a World Heritage Site by UNESCO.

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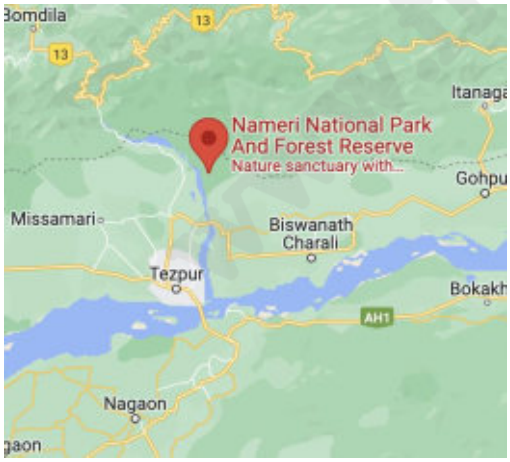
- Along with the iconic Greater one-horned rhinoceros, the park is the breeding ground of elephants, wild water buffalo, and swamp deer.
- The park is recognized as an Important Bird Area by BirdLife International for the conservation of avifaunal species. Birds like lesser white-fronted goose, greater adjutant, black-necked stork, and Asian Openbill stork specially migrate from Central Asia during the winter season.
- Due to the difference in altitude between the eastern and western areas of the park, here one can see mainly four types of vegetation' like alluvial inundated grasslands, alluvial savanna woodlands, tropical moist mixed deciduous forests, and tropical semi-evergreen forests
- **It is situated on the southern bank of the Brahmaputra River at the foot of the Mikir - Karbi Anglang Hills** about 8 km from Bokakhat and 220 km east of Guwahati.

- **Nameri National Park** covers an area of 200 sq Km. With river Jia Bhoroli bifurcating the park, it is the most scenic of all the national parks of Assam.
  - It's on the eastern border of Assam in the valley and mountainous Arunachal Pradesh. It was set up as a sanctuary in 1985 with an area of 137 sq. km. In 1998 it was officially established as a National Park. Nameri is home to some the endangered species like a white-winged wood duck, Sloth Bear, Tiger Leopard, Clouded Leopard, Sambar, Gaur, and Indian Wild Dog.
  - The other reason Nameri is famous for is the herds of elephants. The park has a high density of elephant population due to the lessening of forest cover.
  - **It is located to the north of the river Brahmaputra.**
- **Orang National park**
  - **It is located on the north bank of the Brahmaputra River** in the Darrang and Sonitpur districts of Assam, India.
  - It was established as a sanctuary in 1985 and declared a National Park on 13 April 1999. It is also known as the mini Kaziranga National Park (IUCN site) since the two parks have a similar landscape made up of marshes, streams, and grasslands and are inhabited by the Great Indian One-Horned Rhinoceros.
  - The park has rich flora and fauna, including Great Indian One-Horned Rhinoceros, pygmy hog, elephants, wild buffalo, and tigers. It is the only stronghold of the rhinoceros on the north bank of the Brahmaputra river.



- **Hence option (b) is the correct answer.**

Q 87.D

- **International Drought Resilience Alliance (IDRA):**
  - **The IDRA was first announced by Spain at the 77th session of the UN General Assembly in September 2022, to be officially launched at the UNFCCC.**
  - Spain and Senegal led 30 countries and 20 organizations to launch IDRA at the 27th Conference of Parties (COP27) to the United Nations Framework Convention on Climate Change (UNFCCC).
  - **The alliance is jointly convened by the President of Senegal and the President of Spain. Hence statement 1 is not correct.**
  - **India is not a part of IDRA. Hence statement 2 is not correct.**
  - The alliance will function as a collaborative platform that catalyzes political momentum and mobilizes resources for targeted actions to enhance drought resilience.
  - Droughts have increased in frequency by 29% since 2000, with around 55 million people affected every year.
  - Alliance will also collaborate with other platforms like WMO to achieve universal coverage of early warning systems.

Q 88.A

- Ramgarh Vishdhari Wildlife Sanctuary was notified as a tiger reserve on May 16, 2022, after a nod by the Union Ministry of Environment, Forest and Climate Change (MoEF&CC) in July 2021.
- **It is now India's 52nd tiger reserve and Rajasthan's fourth, after Ranthambore, Sariska, and Mukundra.**
- **The National Chambal Gharial Sanctuary emerging from Hadoti has also been included in the Tiger Reserve. It is included as the core.** This will also stop illegal mining and fishing from taking place here. This will improve the condition of aquatic organisms in Chambal and their numbers will increase. **Hence, statement 1 is correct.**
- Due to the increase in the population of tigers and the reduction of space in Ranthambore, now the mutual conflict of tigers will be curbed and the tigers will also get better habitat. **With Ramgarh Vishdhari Sanctuary being a tiger reserve, there will be a seamless movement of tigers from Ranthambore to Mukundra. Hence, though having less number of tigers, it will play an important role in connecting the Ranthambore and Mukundra Tigers reserves of Rajasthan. Hence, statement 2 is not correct.**

Q 89.C

- The Indian elephant 'Elephas Maximus occurs in the central and southern Western Ghats, North-east India, eastern India, northern India and in some parts of southern peninsular India. It is included in Schedule I of the Indian Wildlife (Protection) Act, 1972, and in Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). It occurs in 16 of the 28 states in the country and is showing an increasing trend across its distributional range.
- Recently, the Union Minister for Environment, Forest and Climate Change released "Elephant Reserves of India: An Atlas" on 12th August which is celebrated as World Elephant Day.
- **India has 31 Elephant reserves. In the last three years, Dandeli Elephant Reserve has been notified by the state of Karnataka, the Singphan Elephant Reserve by Nagaland, and the Lemru Elephant Reserve in Chhattisgarh. This has brought the total area under Elephant Reserves in India to about 76,508 sq. km across 14 states of the country. Hence, pairs 2 and 3 are correctly matched and pair 1 is not correctly matched.**
- **Also, Nilambur Elephant Reserve is in the state of Kerala. It has a total area of 1419 (sq. km). So, the pair 4 is also matched correctly. Hence, option (c) is the correct answer.**

Q 90.C

- **Recently a bridge collapsed in Morbi across Machchhu river.**
- The Machchhu river rises in the **hills of Jasdan** near village Khokhara in Chotila taluka of Surendranagar districts.
- This is one of the North flowing rivers of Saurashtra in Gujarat state.

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- The river Machchhu originates from the **hill ranges of Jasdan Sardar and Mandva in Rajkot district and Chotila in Surendranagar district** and flows in North Westerly direction along the district boundry of Surendranagar and Rajkot upto village Beti and then flows mostly towards North in Rajkot district and finally disappears near Malia in the little **Rann of Kachchh**. **Hence statements 1 and 2 are not correct.**
- Machchhu alongwith its tributaries flows 52% in the hilly area and 48% in plain region.
- The total length of this North flowing river from its origin to its outfall into the little Rann of Kachchh is 141.75 km. Machchhu receives several tributaries on both the banks. There are 6 major tributaries having length more than 25km out of which 4 tributaries namely J**amburi, Benia, Machchhori and Maha** feed from the right and the remaining 2 tributories namely **Beti and Asoi** from the left. The drainage system on the right bank of Machhu is more extensive as compared to the left bank. **Hence statement 3 is correct.**
- The suspension bridge, "Jhulto Pul", was a pedestrian suspension bridge that was inaugurated in 1879, during the reign of Sir Waghji Ravaji, the Thakur Sahib of Morbi (1858-1922) Sir Waghji is credit with planning and building the entire city of Morbi, which included India's first art deco palace, and a European-style central square known as Green Chowk.

Q 91.D

- Mangrove are salt tolerant evergreen forest ecosystem found mainly in the tropical and subtropical inter-tidal regions of the world between approximately 32° N and 38° S latitude and total mangrove cover has been estimated to be approximately 15.6 million hectares globally. **Hence statement 1 is correct.**
- They provide potential contributions in ecological services, provides habitat for many terrestrial and marine species, various food resources, shelter and site for fertilization for variety of aquatic fauna resulting into rich biodiversity.
- Mangroves distribution and abundance in intertidal areas could be considered as a direct indicator of the habitat health of the coastal ecosystem and they are highly sensitive to environmental change. Mangroves exhibit Viviparity mode of reproduction i.e. seeds germinates in the tree itself (before falling to the ground). This is an adoptive mechanism to overcome the problem of germination in saline water. **Hence statement 2 is correct.**
- It produces pneumatophores (blind roots) to overcome respiration problem in the anaerobic soil conditions. **Hence statement 3 is correct.**
- Some mangroves secrete excess salt through their leaves.

Q 92.B

- **Recently, Prime Minister paid tributes to Acharya Kripalani on his Jayanti.**
- Jivatram Bhagwandas Kripalani (11 November 1888 – 19 March 1982), popularly known as Acharya Kripalani, was an Indian politician, noted particularly for holding the **presidency of the Indian National Congress during the transfer of power in 1947** and the husband of Sucheta Kripalani.
- Kripalani was an environmentalist, mystic and independence activist who was long a Gandhian socialist, before joining the economically right wing **Swatantra Party later in life.**
- He earned the title **'Acharya' around 1922 when he was teaching at the Gujarat Vidyapith, founded by the Mahatma** a couple of years before. From 1912 to 1927, he taught at various places before becoming wholly involved in India's freedom movement.
- He met the Mahatma during the **Champaran Satyagrah in 1917.** He was a close associate of Gandhiji and actively participated in **Non-Cooperation Movement, Salt Satyagraha, and the Quit India Movement.**
- He was elected Congress President in 1947.
- Among founders of the **Kisan Mazdoor Praja Party**.
- He was the author of several books, including **Gandhi: His Life and Thought (1970).**
- He **moved the first-ever No confidence motion in Lok Sabha in 1963.**
- Kripalani was a harsh critic of both Jawaharlal Nehru and Indira Gandhi.
    - He opposed Nehru's policies, which he thought were against Gandhian values, and later opposed Indira's policies too.

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- In 1972-73, he and other socialist leaders led movements across the country urging people to lead non-violent protests against Indira's government.
- In 1975, when Emergency was declared, Kripalani was among the first political leaders to be arrested.
- In his autobiography **My Times** published after his death in 1982, he criticised the entire Congress leadership, except Mahatma Gandhi, for Partition.

- **Hence option (b) is the correct answer.**

Q 93.C

- Recently, a phenomenon called "coronal holes" was spotted on the sun.
- Coronal holes appear as **dark areas** in the solar corona in **extreme ultraviolet (EUV) and soft x-ray solar images. Hence statement 1 is correct.**
- They appear **dark because they are cooler, less dense regions than the surrounding plasma** and are regions of open, unipolar magnetic fields. This open, magnetic field line structure allows the solar wind to escape more readily into space, resulting in streams of relatively fast solar wind and is often referred to as a high speed stream in the context of analysis of structures in interplanetary space. **Hence statement 2 is not correct.**
- The magnetic field of the Sun plays an important role in terms of what we see on these images. The bright areas on these images show us hot and dense gas that is captured by the magnetic field of the Sun. The dark and empty looking areas are places where the magnetic field of the Sun reaches into space so that these hot gases can escape.
  - **The magnetic field of a coronal hole is different than the rest of the Sun**. Instead of returning to the surface, these magnetic field lines stay open and stretch out into space. **Hence statement 3 is correct.**
- Coronal holes can develop at any time and location on the Sun, but are more common and persistent during the years around solar minimum. The more persistent coronal holes can sometimes last through several solar rotations (27-day periods). Coronal holes are most prevalent and stable at the solar north and south poles; but these polar holes can grow and expand to lower solar latitudes.
- Persistent coronal holes are long-lasting sources for high speed solar wind streams. As the high speed stream interacts with the relatively slower ambient solar wind, a compression region forms, known as a co-rotating interaction region (CIR). From the perspective of a fixed observer in interplanetary space, the CIR will be seen to lead the coronal hole high speed stream (CH HSS).
- These 'coronal holes' are important to understanding the space environment around the earth through which our technology and astronauts travel.

Q 94.C

- Photoperiodism is the response to changes in daylength that enables plants to adapt to seasonal changes in their environment. **Hence option (c) is the correct answer.**
- The best studied example of photoperiodism in plants is flowering, but other responses to daylength include bud dormancy and bulb or tuber initiation. Seasonal flowering in response to daylength helps species to adapt to particular habitats and synchronize flowering for maximum pollination efficiency. Daylength is perceived in leaves, while the response occurs elsewhere in the plant.
  - Plants that flower only when day length drops below a certain threshold are called short-day plants. Rice is an example of a short-day plant.
  - Plants that flower only when day length rises above a certain threshold are called long-day plants. Spinach and sugar beets are long-day plants.
- By flowering only when day or night lengths reach a certain threshold, these plants are able to coordinate their flowering time with changes in the seasons.

Q 95.B

- **South Asian River Dolphin is divided into 2 sub-species:**
  - Ganges river dolphin (P. g. gangetica)
  - Indus river dolphin (P. g. minor)
  - Distribution: India, Bangladesh, Nepal & Pakistan.

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- **Conservation Status**:
  - IUCN Red List Status: Endangered
  - Wild Life Protection Act: Schedule I
  - CITES: Appendix I
- **Irrawaddy Dolphin is also found in Chilika Lake in Odisha. Hence statement 1 is not correct.**

- **Ganges River Dolphin - Susu (P. q. gangetica):**
  - It is an indicator species for the river Ganga.
  - Because of the sound it produces when breathing, the animal is popularly referred to as the 'Susu.
  - Susu can only live in freshwater and is essentially blind. Hence, also known as blind dolphin. They hunt by emitting ultrasonic sounds.
  - Distribution:
    - Ganges-Brahmaputra-Meghna
    - Karna phuli-Sangu river systems of Bangladesh & India
    - Sapta Koshi & Karnali Rivers in Nepal.
  - The Ganges River dolphin has been recognized by GOI as its National Aquatic Animal in 2009.
  - It is also State Aquatic Animal of Assam.
  - The Ganges River Dolphin is currently listed on Convention on Migratory Species. **Hence statement 2 is correct.**
  - **Conservation Measures by India:**
    - Vikramshila Gangetic Dolphin Sanctuary in Bihar (Only Sanctuary for Dolphin Conservation).
    - Project Dolphin on lines of Project Tiger aims to save both river and marine dolphins, implemented by Environment Ministry.
    - Conservation Action Plan for Gangetic Dolphin (2010-2020) Included among 21 species under Integrated Development of Wildlife Habitat.
    - National Ganga Council was set up to save & enhance population of Dolphin.
- **Indus River Dolphin (P. g. minor):**
  - State Aquatic Animal of Punjab.
  - Habitat: Indus River in Pakistan and its Beas and Sutlej tributaries.
  - River Beas is the only habitat of Indus River Dolphin in India. **Hence statement 3 is correct.**

Q 96.D

- **Recent context:** The migratory monarch butterfly, a sub-species of the monarch butterfly that travels around 4,000 kilometres across America each year, has been classified **'endangered**' in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. **Hence statement 3 is correct.**
- This is one of the most recognisable butterflies in the world.
  - **In North America, millions of monarch butterflies undertake the longest migration of any insect species known to science. Hence statement 1 is correct.**
- **Most of these butterflies winter in the California coast and forests in central Mexico**. A smaller population of the species is also found in countries like Australia, Hawaii and **India**. **Hence statement 2 is correct.**
- These butterflies follow a unique lifestyle: They traverse the length and breadth of the American continent twice a year, feasting on nectar from a variety of flora. But they breed in only one particular plant — **the milkweeds**. The monarch larvae feed on this species on hatching.
- Threats: Loss of habitat, increased use of herbicides and pesticides for agriculture, and climate change.

Q 97.C

- An ecotone is a **zone of junction or a transition area** between two biomes (diverse ecosystems). Ecotone is the zone where two communities meet and integrate. For e.g. the **mangrove forests** represent an ecotone between marine and terrestrial ecosystem. **Hence statement 1 is correct.**
- Other examples are **grassland** (between forest and desert), **estuary** (between fresh water and salt water) and **riverbank or marshland** (between dry and wet).

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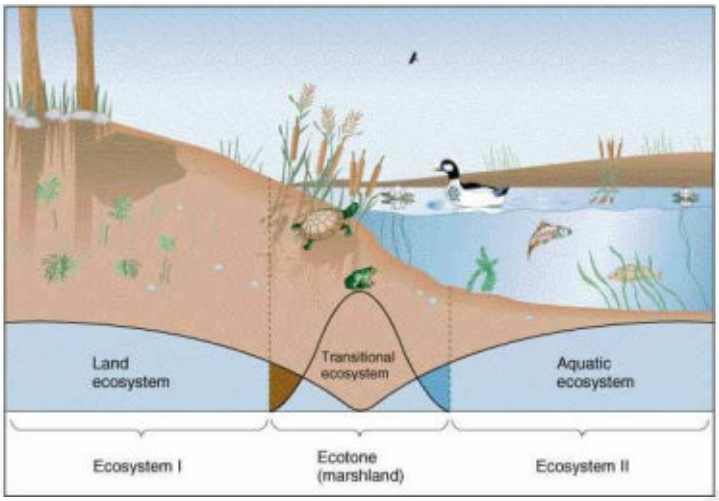
- It may be narrow (between grassland and forest) or wide (between forest and desert).
- It has **conditions intermediate** to the adjacent ecosystems. Hence it is a **zone of tension.**
- Usually, the number and the population density of the species of an outgoing community decreases as we move away from the community or ecosystem.
- A well-developed ecotone contains some organisms which are entirely different from that of the adjoining communities.
- Ecotone regions like mangroves, wetlands, estuaries etc have far greater productivity than natural ecosystem like a forest ecosystem, ocean ecosystem, pond ecosystem, riverine ecosystem etc.
    - This is because of the wide-ranging species from the adjacent ecosystem being present in the ecotone and it has far greater productivity than natural ecosystem. **Hence statement 2 is correct.**
- Edge effect:
    - Edge effect refers to the **changes in population or community** structures that **occur at the boundary of two habitats (ecotone).**
    - Sometimes the number of species and the population density of some of the species in the ecotone is much greater than either community. This is called **edge effect.**
    - The organisms which occur primarily or most abundantly in this zone are known as **edge species.** In the terrestrial ecosystems edge effect is especially applicable to birds. For example, **the density of birds is greater in the ecotone** between the forest and the desert.



Q 98.A

- **The 14th conference of the parties to Ramsar Convention on wetlands adopted the Wuhan Declaration.**
- **The Wuhan Declaration calls for practical actions to promote conservation, restoration, management and sustainable use of wetlands worldwide.**
- Key priorities of Wuhan declaration:
    - Take measures to **halt and reverse wetland loss globally.**
    - **Incorporate wetlands into national actions** to contribute to domestic legislation, plans and implementation of SDGs.
    - **Define strategic goals and priority areas for wetlands** in partnership with civil society stakeholders, academia and private sector.
    - Importance of healthy wetland ecosystems as **nature-based solutions for climate mitigation, adaptation and disaster risk reduction.**
- **Hence option (a) is the correct answer.**

Q 99.D

- **Rhino Species Across the World:**
    - **White Rhino & Black Rhino** are found in Africa. **Black Rhino is smaller of the two African species.**
    - **Javan Rhino:** only a small number survive in Java and Vietnam.
    - **Sumatran Rhino: Sumatran rhino is the smallest species of rhinoceros. 30 to 80 Sumatran rhinos remain in the world, mostly on the Indonesian island of Sumatra.**

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- **Great One-Horned Rhino: Only the Great One- Horned Rhino is found in India.**
- Both African and Sumatran rhinoceros have two horns, while the others (Indian and Javan) have a single horn.
- Only about 24,500 rhinos survive in the wild. Of these, more than two-thirds are white rhinos.
- Rhinos are killed for their horns, which consist of keratin similar to human hair and nails and are used in traditional medicines in parts of Asia.

- **India's Greater One-Horned Rhinoceros (Indian Rhino):**
  - Habitats: Tropical & Subtropical Grasslands, Savannas, & Shrublands.
  - Indian rhinos once ranged across the entire northern part of the Indian subcontinent.
  - Now they are confined to the alluvial grasslands of the Terai of India, Bhutan & Nepal & the Brahmaputra basin.
  - **Major Populations:** Kaziranga National Park, Pobitora Wildlife Sanctuary & Manas National Park.
  - **Greater One-Horned Rhino is the largest of the rhino species (second in size only to the Asian elephant). Hence option (d) is the correct answer.**
  - **The Indian rhino's single horn is present in both males & females.**
  - Threat: Poached for its horn (in South-East Asian countries it is a belief that its horn has medicinal properties), Habitat loss & Habitat fragmentation.
  - **Conservation Status:**
    - IUCN Red List: Vulnerable
    - CITES: Appendix I
    - Wildlife Protection Act, 1972: Schedule I

Q 100.A

- Within any ecosystem, either terrestrial or aquatic, two major types of food chains can be identified.
- They are Grazing food chains and Detritus food chains.
- The grazing food chain begins with green plants at its base as producers.
  - Therefore, plants act as the source of energy for the primary consumers.
  - **In this case, the primary consumer is essentially a herbivore.**
  - Cattle grazing on pastureland, deer browsing in the forest, insects feeding on green plants etc. present the basic consumer groups of the grazing food chain.
- The detritus food chains start from dead and decaying organic matter of animal and plant bodies known as detritus.
  - Here, the detritus act as the source of energy for the primary consumers termed as detritus consumers.
  - **There are two major classes of detritus consumers, namely, detritus feeders and decomposers. Hence statement 1 is correct.**
  - Detritus feeders directly feed on dead plant and animal matter and the examples include invertebrates such as termites, earthworms, millipedes, ants etc.
  - The detritus that is not consumed undergoes decay, rot or decomposition.
  - As a result, the nutrients in them are returned back to the soil and water and are reused by producers.
- **Supplementary food chains in an ecosystem are formed by parasites and scavengers.**
- **The grazing food chains in forests and oceans represent two extreme types.**
  - Ocean food chains are among the longest, up to five links, in contrast to food chains in the forest, which mostly consist of three or rarely four links.
  - The eating of phytoplankton algae by zooplankton and fish is another example of grazing food chain in the aquatic ecosystem.
- **Detritus food chains are located mainly in the soil or in the sediments of aquatic ecosystems. Hence statement 2 is not correct.**
  - They form an essential component of natural ecosystems and are necessary for self-sustenance and for maintaining the ecological balance.

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